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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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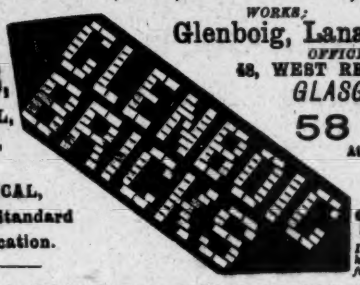

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CLV., No. 3042.] WEDNESDAY, AUGUST 31, 1921. [73RD YEAR.

EDITORIAL NOTES.

No "Present" Limitation of Incombustibles.

THE report of the Committee appointed by the Board of Trade to consider whether it is necessary or desirable to prescribe any limitation of the proportion of incombustibles which may be supplied in gas has come to hand as we are preparing for press; but the document is published *in extenso* in other columns. Any comment upon the report must be deferred for a week; but meantime it will be noted with intense satisfaction by the gas industry that the Committee —Mr. James Hunter Gray, K.C., Chairman, Mr. W. J. Atkinson Butterfield, M.A., F.I.C., and Dr. C. H. Lander— are deliberately of opinion that it has not been established in evidence that restriction of incombustibles is necessary *at the present time* as a safeguard of the interests of the consumer. The words "at the present time" are significant and highly important, because they indicate that the Committee are not prepared to apply the present evidence to the developments that may take place during this transition period in the history of the industry, nor to give a verdict at the genesis (so to speak) of transition that would have application to all time and to all circumstances. They desire to have the opportunity to see exactly what will happen, and not to supply the ground for restrictive legislation on the unknown. It is clear they see in the evidence the possibility of developments which may at a later date furnish stronger testimony in favour of a limitation of incombustible constituents in town gas, or—mark this!—"certain of "them." The Committee have obviously got their eye upon carbon dioxide. However, the gas industry will be thankful to the Committee for making so transparent their desire to be just in this matter, and not at the present stage to suggest or to do anything to curb the technical growth and expansion of the gas industry—liberty being of the very essence and spirit of the Gas Regulation Act. In view, however, of the present (we might almost say) chaotic conditions of the industry through change in legislative ability and policy, in financial circumstances, and in war-belated improvements, extensions, and technical progress and determination, the suggestion that the matter should be reopened by a further inquiry after a period of only three years is bound to be criticized as erring on the side of brevity in respect of time allowance for re-settlement under the new conditions. We can see points both in favour and against the three years; but more as to this when we return to a further examination of the report. We must, however, take this opportunity of acknowledging the care, patience, and courtesy of the members of the Committee throughout what was a very difficult inquiry, with so many interests claiming consideration. The Committee also express their high appreciation of the very valuable assistance rendered by their Secretary (Mr. W. H. L. Patterson); and this all who have had any concern in the proceedings will heartily endorse. While saying this, although somewhat out of place, we should like to mention specially the great help and value of the services in the companion carbon monoxide inquiry of Mr. H. L. Spencer, the Secretary to the Committee who had that subject under investigation.

Embarrassing Coal Accumulations.

ONE thing is certain in connection with the coal position. Somebody has got to lose something. People will not buy at present prices; and the coal lying at pitheads and in wagons on the sidings and at ports has been produced at extravagant cost. Somebody has to make a sacrifice on that, in order to create business, and to keep the coal industry going. The position simply means that people are tired of being the victims of what has been and is going on in the coal industry; and other industries are making slow recovery and cannot do better while fuel costs so much, and materials are so high in price largely in consequence. So far this applies to values at the pithead. As to retail prices, the other day we saw a coal-cart going into a poor London district with chalked on the side "3s. 5d. per cwt.," which works out to £3 8s. 4d. per ton—a price wicked and preposterous. Would-be purchasers at a lower price will not have the stuff at present charges, and so the accumulations continue. In the week ending Aug. 13, 4,537,300 tons of coal were produced; and this with 1,050,000 persons employed—a reduction in number of about 15 p.ct. compared with the pre-strike period, and representing per year of fifty weeks an average output per person of 216 tons, which is much below the outputs of years ago referred to in a succeeding article. But the output mentioned is better than the average weekly figure for the quarter preceding the strike, when so many more people were employed. There has also been a reduction of about 8 p.ct. in the mines at work which are unprofitable to operate or are derelict through flooding. One day last week it was stated that there were 50,000 colliers idle in South Wales and 3000 in North Wales; and several collieries in these areas are only working three days a week. In all directions, it is said that there must be further reductions in price. It is reported that the South Wales owners have decided to reduce on Sept. 1 the price of best household coal by 10s. per ton in addition to the reduction of 7s. 2d. about a month ago—thus making the pithead price 35s. or 36s. per ton. The retail price of this coal, it is said, will now be 53s. per ton. The report is also to hand that several collieries in the North-Eastern area have lowered their charges by 7s. 6d., and that this is also to be passed on to the consumers. But it is not enough, and it is not general. In other areas the owners appear to be holding-out in the hope that atmospheric conditions will come to their aid, and that industries will be forced into the position of having to buy in heavier quantities. There will no doubt be a progressively greater demand; but it does not look as though the next few months are going to witness a boom in industrial demand and trade in this country. We have to go a long way yet before being in a position to compete with certain other countries. Meanwhile, the general situation as to gas coal appears to be that gas-works have accumulated what is considered to be a safe quantity for stock purposes, and deliveries are now merely being made to suit current requirements. Where contracts have been entered into, they are generally for only short terms. From Northumberland and Durham the report comes that special classes of gas coal have been further reduced in price, and that some very good qualities of second-class coals can be obtained at from 26s. to 27s. 6d. per ton.

Coal Prices and Miners' Inefficiency.

IN the current "Fuel Economy Review" of the Federation of British Industries, there is an enlightening article, of considerable length, by Prof. Henry Louis, M.A., D.Sc., who has had a life-long experience of mining and of the economics of coal production. Some people do not appreciate that the present heavy cost of coal is not only due to excessive wages and other higher expenses of production, but to the over-manning of the industry and the low production per man. These are weak spots in the coal position; and the weaknesses have to be cured before the industry can hope to recover a large part of its old economic status, and enable both the industry and the country generally to reach

once more the high road to prosperity. Grave warning and gloomy prediction are found in the statement that "it is becoming increasingly evident that, unless work is to be done in the future in a different spirit from what it has been in the past, the British coal industry is doomed to disappear." If Prof. Louis is right in this, no Miners' Federation would be required then, no local Miners' Unions, and in fact no miners. This is an appalling outlook. We have no fear it will come about; but the fact stands out boldly that this is the direction in which the coal industry has been drifting. It is for the men of the industry—owners, miners, and all concerned—to work their respective stearing gears in mutual accord so as to set the face of the industry in the opposite direction.

There is a table in the article which gives statistical information over a long period. It shows how the movement during the past twenty years has been to lower production per person employed at much higher wages; and these two factors are the main reasons for the high cost of production, which necessitates excessive prices at the pit-head. The record starts with 1900, and ends for a complete year with 1920. In 1900, the total number of persons employed under and above ground was 766,901; and the production was 223,226,000 tons for the year. This gives an average production per person employed of 291·1 tons. The average pit-head price was 10s. 9·66d. per ton. In 1920, the number of persons employed was 1,248,224; and the output was 229,503,435 tons. This works out to an average per head of 183·9 tons, or no less than 107·2 tons below the average individual production of 1900! The average pit-head value in 1920 was 37s. 7·78d. As the number of persons employed has increased, the production per head has been reduced; and as production per man has been lowered, pit-head values have increased. Through these two decades fresh concessions have been made to the miners; and during the last seven years their wages have risen enormously. Take the two years that have the closest relation in production—1904 and 1919. The respective outputs were 230,405,200 tons and 229,743,128 tons. But whereas the 1904 production was the result of the labour of 833,629 persons, the 1919 production was the result of the labour of 1,191,313 individuals—an increase of 357,684. The average production per head in the respective years was 276·4 tons and 192·9 tons—a decrease of 83·5 tons. To put the statement another way, in the fifteen years there was an increase of no less than 42·9 p.ct. in the numbers employed (41·1 p.ct. in underground labour, and 50·3 p.ct. in surface labour) to produce the same amount of coal, or slightly less. This is a very serious feature in the situation; and another one is—this being a matter which we do not notice Prof. Louis particularly emphasizes, though so important to industry—the production of 1920 included a much greater proportion of incombustible material than that of 1900. The depression in productive capacity commenced long before the war; and it has increased in severity with the progress of concessions to the miners and increased pay.

In the quarter ending Sept. 30 last, the aggregate amount paid in wages averaged 26s. 3·06d. per ton. This figure and others show quite clearly that the wages per ton (which is an item that can be lowered not only by a direct reduction of wages, but by the operation of increased production per man) constitute, as Prof. Louis remarks, so very large a proportion of the total costs that any decrease that can be made in any of the other items of production must be quite insignificant compared with what can be reasonably effected through wages. He also points out that we must get coal down to 20s. per ton at the pit-head before our industries—particularly iron and steel—can hope to compete with a fair chance of success in the world's markets. How is this to be done? It is a big jump from present prices; but there is the irrefutable fact that our industries must languish, less demand be made on the coal industry, and consequently less employment be found in it, unless coal does come down to a price that will enable our manufactures and trade to recover. With this in view, Prof. Louis advocates profit-sharing in the mining industry. This is coming about under the recent settlement. He also suggests that a reserve should be built-up in prosperous times, out of which it would be possible to maintain wages and profits at a fixed minimum standard, whenever, owing to bad trade, the results fall below the figures thus fixed. It would depend on what the minimum standard was whether it would be generally acceptable; seeing that it might be put at a figure that would prove a hardship on the already long-suffering consumers through the price paid for coal. In other words, the consumers would be deprived of the full result of the operation of the law of supply and demand, as, in fact, they are now through the restriction of competition by agreements among the colliery proprietors as to prices—such as was recently seen in the 3s. per ton decision of the owners in certain areas for household and gas coal. Prof. Louis also holds that the present system of free coal, or only at a nominal charge, to miners should be abolished. A considerable amount of coal is thus distributed; and it is used in an extremely wasteful fashion. Then he suggests that wages should average 13s. 6d. per ton; and if the output averaged 260 tons per man, this would mean a wage of £176 10s. Of course, this is an average; and it is probable that hewers would get about £200 a year or a little over, and other workers (including boys) an average of about £150. The miners point to the rise in the cost of living. The miners are largely to blame. Look at the reduction in the output of coal, and the cost of wages per ton. It is largely the abstention of miners from work that raises the price of commodities. Therefore, the plea of the miner that his wages must be maintained to meet the rise in the cost of living will not receive much sympathetic consideration, in view of the fact that it is largely due to himself.

However, everywhere abroad the cost of coal production is lower than in this country; and, therefore, there will be general agreement with Prof. Louis that there is imperative need, unless this country is to go-under industrially, for a higher output per man employed, which will reduce materially the cost of production, and so lower the price of coal. The miners will be well advised to clear out from their counsels the extremist element who have wrought so much injury to them and the industry, and follow the advice of those who have vision, and the power of forecasting the probable effects of their movements.

"Compulsory" Low-Temperature Carbonization for Gas-Works.

It has not come to this yet; it is only a suggestion—something in the clouds; and there it is likely to remain. But the suggestion emanates from no less a scientific authority than Sir Napier Shaw, F.R.S., the Chairman of the Advisory Committee on Atmospheric Pollution, which Committee has been attached to the Meteorological Office at the behest of the Department of Scientific and Industrial Research. What he says deserves respectful and (this is important) intelligent consideration, because even scientists sometimes run off the track of practicability. When Sir Napier treats of atmospheric conditions, he is both interesting and instructive; and it is in dealing comparatively, in an article in "The Times," with experiences as to those conditions during May this year and May and November last year, that he winds-up with what may be regarded as a fugitive suggestion, made in a more or less hesitating manner.

We must see first what led up to the suggestion in which the gas industry is peculiarly concerned, though the whole of the points in the article have interest for the industry in view of its foremost position in the supply of fluid and solid smokeless fuels, and its accomplished and ever-growing work in contributing to healthier atmospheric conditions. A great deal has been said, and public attention has been arrested by it, as to the clearer atmosphere there was during the period of the coal shortage; and Sir Napier shows that observation is fully confirmed by scientific measurements, The assumed justification for his later suggestion is the obvious fact that, in so far as recent improvement of the atmosphere was due to the lack of raw coal, the improvement can be made permanent by suitable arrangements for the supply of smokeless fuel. The atmospheric conditions in a given district as between a coal-using period and a period when coal was restricted or relatively little used, and as between week-days and Sundays, was at one time merely the subject of opinion and crude computation. But now there is scientific measurement which removes all doubt. Dr. J. S. Owens has devised an instrument for determining the amount of solid impurity in the air at any time and in any place by drawing a fixed volume of air—about 2 litres—through a small area of filter-paper; and the density of the resulting shades caused by the deposits accurately shows the relative impurity in the atmosphere at different hours, days, or other periods, and places. The instrument has been

in use since May 10, 1920, and has therefore been carried through an ordinary May, an ordinary November, and an extraordinary May—extraordinary for the conspicuous clearness of the atmosphere.

From the figures for November (which may be taken to represent winter conditions), it has been found that the dirt in the atmosphere on Sunday is two-thirds that of a week-day; and the Committee conclude from this that, so far as Westminster and South Kensington are concerned, two-thirds of the dirt in the atmosphere may be attributed to domestic operations and one-third to the industrial operations of railways, factories, &c. This is a matter of considerable interest to the administrators of gas-supply undertakings whose present and future work lies so extensively in the domestic heating field. But we would point out that the two-thirds domestic to one-third industrial impurity can only be regarded as a rough allocation of contribution between the two generic sources, seeing that railway, electricity, and waterworks chimney shafts, and the chimneys of a number of hotels, &c., are contributing impurities on those days as well as week-days, besides which not a few of our manufacturing establishments do not entirely let-down all their furnaces during the week-end halt. Moreover, Westminster and South Kensington do not appear to us to be the best of areas for making scientific measurements which would have the most general application. The residential suburbs of London would afford a better index to atmospheric conditions as between Sunday and week-days; and even figures from these areas could not be accepted as supplying any ratio as between night and day pollution and Sunday and week-day in the industrial centres. Sir Napier does not present his figures as showing anything but the differences between the atmospheric conditions in the two London districts. That must be emphasized. But we should like to point out to him—as bearing on the domestic contribution to atmospheric pollution, and as indicating that the measurements would be much worse had it not been for the success of the gas companies in gas-heating—that the three London Gas Companies have on hire no less than 1,095,256 stoves (excluding all privately owned ones); and that in the United Kingdom there are roundly on hire about 5 million gas-cookers and other apparatus for food preparation. This being so, the domestic contribution to the impurity of the atmosphere must come from the household fires for room heating rather than from coal cooking-ranges; and this is accentuated by the fact that during the cooking hours on Sundays, most gas-works reach the peak of their weekly load. However, the available evidence from the atmosphere points to the fact that it is the domestic problem that is the more urgent one.

Just one point more, before getting to the remedies for atmospheric fouling by coal. The article includes a table showing the records of air pollution hour by hour as provided by the new instrument. In May, 1920, the shades on the filter-papers ran pretty equal from midnight to about 4 o'clock in the morning, and then gradually got denser as noon approached, and the diminution proceeded gradually during the afternoon and evening until the night minimum was again reached. The same thing occurred in May this year. But the maximum period of impurity during the middle hours of the day shows a marked decline from the records of May, 1920. The same course of things occurred during November. But then the densities of the records during the midday hours are very heavy—they are approached in the same gradual fashion from midnight, but the tailing-off is a much slower process, and there is no really material diminution until late in the evening—the minimum being reached at midnight. From then the night air is much purer than the day air, and for the matter of that so also is the night air during an ordinary summer month. But the early morning air of November is no purer than the midday air of the normal May of 1920.

Certain as to the cause of atmospheric impurity, less certain is Sir Napier Shaw of the cure. It does not fall within the functions of his Committee to determine what remedial measures should be taken; but they cannot avoid a little speculation as to what should be done if it was decided that the use of raw coal should be prohibited in the domestic fireplace. There is semi-coke from low-temperature carbonization, gas coke from high-temperature carbonization, and gas, electricity, and oil. The three latter fuels are dismissed. They are substitutes for coal in the case of those who can afford them. Perhaps the two figures quoted by us earlier as to gas-stoves on hire (excluding privately owned ones) will suggest that gas should not be dismissed lightly in company with electricity and oil. Sir Napier can be shown many all-gas kitchens, including apparatus for the incineration of rubbish, the heat derived from which is applied to water-heating. However, he leaves his own well-known ground, and trespasses on other, and shows that, in one particular matter, he is not in the position to discriminate between practicability and impracticability. He has a fancy for solid smokeless fuel produced by the treatment of coal by low-temperature carbonization; but he does not personally know much about the process as a satisfactory and an economical one, or the contrary. "From all that "appears in public prints, it *seems* that coal carbonized at a "low temperature would meet the case. . . Yet the sug- "gestion makes little or no progress." Much of what appears on this subject in the public prints has such a density in respect of nonsense and vagueness that, if it could be measured by the new instrument, the result would be more remarkable than a November noon atmospheric impurity record. Unfortunately there is no scientific instrument that can measure postulation, or separate fact from that which is not fact; and so we read from the pen of Sir Napier: "The "simple fact appears to be that the duty of supplying a fuel "of that kind could easily be undertaken by the local gas "companies, and not easily by independent establishments." It could not be easily undertaken by the gas companies. Sir Napier does not know anything about the capital and labour expenses that would be entailed in treating coal at low temperature in order to obtain the 250,000 million cubic feet of gas required by the statutory gas undertakings at the present rate of consumption. He does not know anything about the special coal and special treatment necessary to smooth working in low-temperature carbonization. He does not know anything about the possibilities of the markets for the secondary products. He has not the ghost of a notion whether his adopted remedy would increase the cost to consumers of the labour-saving, subterranean distributed fuel, which constitutes the principal business of gas undertakings, and which can be used at a higher efficiency than solid fuel. He does not know much else—the second part of his article proves it—that affects the commercial aspect of the matter. But practical carbonizers can apply their knowledge to the problem; and they see nothing in all that has been so far presented to induce them to revert to the carbonizing practices that inaugurated the gas industry. Sir Napier is not a practical carbonizer, nor a trader in the products of coal carbonization. Because he is not, he concludes his article thus: "Apparently the gas undertakings "prefer to deal in coke carbonized at high temperature and "gas, rather than trouble about carbonizing coal at lower "temperature. Hence compulsion, if it comes, cannot "properly be confined to the ordinary householder, but "somehow must reach those whose business it is to car- "bonize coal for the community." This means compulsory carbonization of coal at low temperature. Quite unwittingly, Sir Napier would consign the gas industry to a career of uneconomy. That is not scientific.

What is Your Consumption per Head of the Population?

For Great Britain, the census shows a population on June 19 last of 42,767,530. It is not likely that Ireland has stood still in respect of population during the last decade; but assuming it has, the 4,390,219, which was the number of the population in 1911, makes a total of 47,157,749. Adopting the commonly accepted divisor of 5 as representing a household, then we get to 9,431,550 householders. The population of Great Britain alone has in the ten years increased by 1,936,134. The last-issued Board of Trade returns for the year 1919 in the case of companies and for that to March 31, 1920, in the case of works owned by local authorities, show the total number of consumers to be 7,540,133. Therefore, we may assume that there are approximately 1,891,417 householders (or about 20 p.ct.) scattered about the country, some off the track of gas-mains and probably many not, without a supply of gas. Anyway, about 80 p.ct. of the householders of the country may be taken to be patrons of gas to varying extent. There is in the 20 p.ct. of non-consuming householders scope for improvement in the domestic gas business; but it is less expensive to work among consumers already connected to the mains for an increase of consumption by means of cookers,

fires, water-heating appliances, gas-irons, and so forth. The 7,540,133 consumers in the last return year purchased 228,537,998,000 c.ft. of gas, which averages 30,310 c.ft. per consumer. This is very good. But if we divide the total consumption by the 47,157,749 (which we have assumed represents the population of the United Kingdom as the result of the last census and the addition of the figure for 1911 for Ireland), we get a consumption per head of the population of 4846 c.ft. The consumption of gas per head of the population is a good standard to adopt for measuring the progress of a gas undertaking, as it includes all contributors to the demand for gas. Which gas undertakings exceed this 4846 c.ft. *per caput* of population? Which undertaking can actually claim the consumption record per head in the United Kingdom?

Neutral and Dry Sulphate.

Too great an emphasis cannot be laid on the importance of sulphate of ammonia being neutral, and the moisture reduced to a very modest percentage. If the latter is down to a figure in the second place of decimals, and then a low one, so much the better. Those men who sneer at refinements in this regard, and speak of them as unnecessary, are blind or peculiarly obstinate. There are three reasons for the higher quality in respect of ammonia, acid, and moisture. The first and most insistent is competition. Knowing as we do that the Germans were in 1913 doing export business with the synthetic product that was quite neutral and practically free from moisture, and knowing how largely the plant has been extended in Germany, and is being brought to working condition here and in other countries, there is occasion for not only reflection, but for activity. In the recent statistical supplement to the final report issued by the Nitrogen Products Committee, it was seen that whereas "*nil*" appears against synthetic ammonia plant in 1912, for 1920 there stands as the productive capacity of plants in the world 1,503,000 long tons; and more plant is being installed. We do not want to be alarmists; but as there is no necessity to be beaten on quality, it would not be wise to ignore the merits of a commodity offered by competitors. Moreover, for transport sulphate is not required that will rot bags; and farmers do not want material that is undrillable. All this notwithstanding, much of the sulphate of ammonia produced by British gas undertakings, coke-ovens, and producer plants does not come up to the specification of the British Sulphate of Ammonia Federation; and the sulphate that does not possess a high quality will be the first to fall with the development of competition.

The Federation are quoting prices now on the basis of 25¾ p.ct. ammonia quality, and ordinary qualities are on a 25¼ p.ct. basis. We see in the annual report of the North British Association of Gas Managers a statement by Mr. G. H. Gemmell, F.I.C., the Official Analyst to the Association, giving the results of an examination of 34 samples of sulphate. There was a great difference in the quality of the samples. The maximum strength was 25·76 p.ct. ammonia; the minimum, 23·63 p.ct.; and the average, 25·16 p.ct. Only the sulphate showing the maximum ammonia strength would have come up to the top standard for which the Federation quotations are given; the average quality would not have come up to that needed for the "ordinary" grade; and the minimum is below it. When we come to moisture, the maximum is 8 p.ct., which is a terrible figure; the average is as high as 1·94 p.ct.; and the minimum, 0·06 p.ct. As to free acid, we should imagine that the samples that were absolutely neutral were few in number; inasmuch as the free acid maximum is given as 0·78 p.ct., the minimum as *nil*, and the average as 0·2 p.ct. In his paper before the Southern Association last November (which paper described the South Metropolitan neutralizing and drying process), Mr. E. V. Evans stated that the final salt is dried to a standard of 0·04 p.ct.; and Mr. P. Parrish, speaking of humidity and the difference between the absorption of water by neutral and ordinary sulphate, said that, "with a relative humidity of 50 to 55 p.ct., neutral salt "maintained its dry and drillable character, while ordinary "sulphate as low in acid content as 0·2 p.ct. sulphuric acid "contained as much as 0·1 to 0·2 p.ct. of water, which cer-"tainly rendered the salt undrillable." Seeing that the average free acid in the 34 samples submitted to Mr. Gemmell was 0·2 p.ct. and the average moisture 1·94 p.ct., the bulk of the sulphate of ammonia represented by the samples tested must have been undrillable.

A Trade Union Crisis.

The Secretary of the General Federation of Trade Unions (Mr. W. A. Appleton) has never been a man to hide the truth, nor to refuse to speak out plainly when occasion demands. There is such an occasion now. Labour theorists and extremists have brought the trade union movement to the most serious crisis it has ever had to face. This is the recognition found in the quarterly report of the Federation. It is seen that the unprecedented form of labour disturbances has resulted in a mass of unemployment graver in its extent, length, and weight than has ever before been experienced. But what can be expected when men get to war with economic conditions, and try by idiotic methods to upset them? At the best, their success can be only temporary; for economic conditions cannot be ruled in the way theorists and extremists would have them. Economic conditions are operating again; and for the harvest of unemployment and trade-union enfeeblement, the members have to thank those who have misled them, and who have ignored every fundamental essential which goes to maintain good industrial stability. Mr. Appleton recognizes all these things. He refers to the miners sfrike ("trouble" he calls it out of deference to the tender feelings of those who, Mr. Herbert Smith confesses, caused the stoppage in the quest for something that was wrong), and says that it reacted upon all other trades, and caused them to suffer equally, and in some cases even more severely. Mr. Appleton alludes to the cost of transport, which has also affected employment in the docks, on the railways, on the road, and on the seas. All these matters have created a very serious situation for many trade unions, some of whom have been compelled to suspend benefits, and many of whom are engaged in a very definite struggle to retain their membership and influence. The report acknowledges that, if the trade union movement is to be successful, "it must have a better understanding of its relation to trade and commerce, and a clearer, and perhaps a narrower, conception of its place in the sphere of human affairs."

Chemical Trade Workers.

One by one the big industries are settling-down to work under a reduction of wages. After a great deal of trouble—negotiations, conferences, and several disagreements—a decision for chemical workers was sealed last Friday upon these terms: 1½d. per hour reduction from Aug. 1, and a further ½d. from Oct. 1, and no further reduction before Dec. 31. The employers originally proposed an immediate 2d. per hour reduction.

Preceding the Coal Strike.

Bearing upon the article on an earlier page on "Coal Prices and Miners' Inefficiency," the Mining Department of the Board of Trade have made available some interesting particulars as to the position of affairs in the quarter ending March last—the quarter preceding the strike. The quantity of coal raised in the three months was 53,815,000 tons. Of this amount mine consumption and miners' coal absorbed 6,249,431 tons (about 11½ p.ct. of the total quantity raised), which left for disposal commercially 47,565,569 tons. Of the 40s. 1·05d. representing the net cost of the disposable coal, miners' wages averaged 29s. 8·02d. The number of persons employed was 1,213,204; and the tonnage raised averaged 44·42 per person.

Petrol and Benzole.

The producers of benzole, with the prices of coal and working expenses still high, will not look upon the further reduction of the price of petrol with anything like pleasant feelings. Moreover, with the coal stoppage, the closing-down of the coke-ovens, and the necessity for getting as much as possible into gasholders from the coal available for gas making, the supply of benzole must the last few months have been of a relatively meagre order, which has meant a loss of business at the prices then ruling. The official reduction in the wholesale price of petrol is 5d. per gallon; but the actual reduction is 6d. per gallon—seeing that the charge is now 2s. 5½d., against 2s. 11½d., which latter figure was the retail price of benzole last week in 2-gallon cans, and a 1d. less (2s. 10½d.) in 50-gallon drums. The wholesale prices of benzole were: Delivered in bulk in road or rail tank-wagons, 2s. 5½d. per gallon; in 50-gallon drums, 2s. 6d. per gallon; and in 2-gallon cans, 2s. 7d. per gallon. Benzole, however, in view of the greater power in it, should be able to command a price

equivalent to its merit in duty. The Anglo-American Oil Company, Ltd., state that heavy fuel oil has been reduced per ton from 90s. to 75s., *ex* wharf; and for bunkers the price of Diesel oil has declined to 105s. The reduced prices mentioned are 10s. more per ton delivered.

End of the War and the Munitions Bonus.

By an Order in Council, the declaration has been made that the war officially ends to-day (Wednesday). Does this mean the termination of the Ministry of Munitions special bonus of 12½ p.ct. to timeworkers and 7½ p.ct. to pieceworkers? The Shipbuilding Employers' Federation are evidently of opinion that it does. In view of the reasons which induced Mr. Winston Churchill to make the mistake of granting it, so inspiring discontent in ranks for which he did not intend it, it seems to us the grounds for its continuance have gone—indeed, it might have been taken that they disappeared after the work ended that had direct relation to the prosecution of the war. The Shipbuilding Employers' Federation gave notice to discontinue the special bonus as from Sept. 1; but the Federation of Engineering and Shipbuilding Trades have asked for a meeting to discuss the question early in September. The employers, it is understood, have agreed not to discontinue the bonus until the meeting has been held.

Carbon Monoxide Decision.

The "Yorkshire Post" last Wednesday contained an article by Prof. Arthur Smithells, F.R.S., on the report of the Carbon Monoxide Departmental Committee, as published in last week's "JOURNAL." It was written in popular style, so that the "man in the street" might read and understand. In his concluding remarks, he said: "If I may be permitted to express a personal opinion, it is that the decision of the Committee is the best that could be made in the public interest." This opinion will carry much weight in the Yorkshire area. The subject is one in which Prof. Smithells has long been interested; and he has followed very closely the evidence given before the Committee. Having done this, he also asserts that, in his opinion, the conclusion at which they have arrived is fully warranted by the evidence. He also thinks that the statistics in the recently issued report of the Factory Department of the Home Office on "Carbon Monoxide Poisoning in Factories" are calculated rather to allay than excite alarm in regard to the actual danger attending the practical use of this gas. His final observations are: "It also happens that during the recent coal strike the public have been provided in most places with gas containing a high percentage of carbon monoxide; and yet no evidence of increased casualties has been heard of. I do not think there is the least cause for alarm. It remains the case, as it always has been, that a leak of coal gas—even a small one—should never be tolerated. The only change is that it is going to be rather more important to abide by this simple rule of health." In a letter written to us last week, Sir Dugald Clerk, F.R.S., remarked: "I was very glad to read in the 'JOURNAL' to-day the favourable verdict of the Board of Trade Committee on Carbon Monoxide."

Dealing with Inferior Gas-Tubing.

The most astounding situation that has come to the notice of the Bureau of Gas Inspection of Newark (N.J.) during their flexible gas-tubing regulation and inspection work is the conditions under which they find tubing used in the city for the purpose of conveying gas to portable appliances. How many of us, says Mr. E. Francisco, Supervisor of Gas Service, writing in the "American Gas Association Monthly," would ever believe, without actually having it shown to us, that the average gas-tubing users will take the chance of asphyxiation or other accident by patching an old piece of gas tubing and continuing its use in such a dangerous condition, when for a small expenditure of money a new and safe piece could readily be purchased? When the City of Newark first started to enforce the provisions of the municipal ordinance to prohibit the use and sale of other than tubing that was approved by the Bureau of Inspection of Gas and Gas-Meters, the sale of gas-tubing by the retail storekeepers was thoroughly regulated, and all but reasonably safe tubing was cleared out of the stores. Where necessary, the defective and dangerous types were confiscated and destroyed by the bureau. Unfortunately, municipalities immediately surrounding Newark, and including New York, have no gas-tubing regulations in effect; and the dealers in these cities are able to furnish the dangerous types of tubing to the citizens of Newark who are not eager to take advantage of the warning and protection that the bureau have given them. It is understood, however, by the writer that New York has under consideration such an ordinance, and that it is likely soon to be put into effect.

PERSONAL.

Mr. WALTER T. DUNN, Secretary to the Institution of Gas Engineers, has been co-opted a member of the General Committee of the Engineers' Club, which is to open on Sept. 1, in the premises which were formerly in the occupation of the Road Club, at the corner of Coventry Street and Whitcomb Street, London, W. 1.

Mr. J. HYDE, Assistant Gas Manager to the Malvern Urban District Council, has recently been appointed Assistant Gas Engineer and Manager at Chesterfield.

Mr. W. CRANFIELD, who some little time ago relinquished the work he had been engaged upon at Nuneaton, has now removed to North Street, Atherstone, Warwickshire, from which address his correspondence classes will be continued.

OBITUARY.

J. W. CARMICHAEL.

It is with sincere regret that we have to record the death of Mr. J. W. Carmichael, late Engineer of the Barrhead Gas Company, in the same issue of the "JOURNAL" as contains the announcement of the recommendation of the Council of the North British Association of Gas Managers that, in view of his services to the industry and the Association, he be elected an honorary member. He died on Wednesday, the 3rd inst., aged 66; the funeral taking place the following Saturday in Neilston Cemetery, when the Association were represented by the Vice-President (Mr. Charles Fairweather) and the Secretary (Mr. David Fulton).

Mr. Carmichael, who retired from active life, owing to ill-health, thirteen months before his death, was a native of St. Andrews. For some time he was Manager at Kirriemuir, transferring from there to Barrhead over 36 years ago. On leaving Barrhead, he and Mrs. Carmichael were presented with their portraits in oils, with every good wish of the staff and employees. On that occasion, Mr. Carmichael spoke of the excellent relations which had always existed between himself and those under him.

Erect and dignified, though of humble mien, a familiar figure has been removed from the Association, and from the wide circle who knew him. He is survived by his widow, a daughter, and four sons—one of whom is Mr. Thomas Carmichael, the Engineer of the Portsea Island Gas Light Company.

The "Electrician" Annual Tables.—We have received from Messrs. Benn Bros., of No. 8, Bouverie Street, E.C., a copy of the "Electrician Tables of Electricity Undertakings for 1921," the price of which is 10s. (by post 10s. 9d.). On the present occasion a new form of presenting the statistical information has been adopted, and fresh data have been incorporated, which it is believed will make the tables of still greater usefulness than hitherto. The new form of presentation will also permit of additional information being included as occasion requires. This year the details of the generating and steam-raising plant, which were omitted during the war period, have been restored; and some particulars have been included of the oil-burning apparatus installed by a number of undertakings.

High-School Boys and Meter Reading.—The Editor of the "Intercolonial Gas Journal of Canada" recently had a request from a correspondent for "a short list of gas companies who are having their meters read by high-school boys." The writer understood that this plan is being followed in a number of cases with very satisfactory results. The Editor said he was unable to find any Canadian Gas Company using high-school boys on meter reading; and he expressed the opinion that work of this kind, in order to give all-round satisfaction, must be done by men who can give all their time to it. This in the case of high-school boys would, of course, be impossible. Another aspect of the matter is presented in a letter from the United States which the Editor quoted: "I tried the high-school boys at Joplin (Ill.) some years ago; and at that time it did not prove satisfactory, as the boys were not working regularly, and made too many mistakes."

The "Fuel Economy Review."—In sending out the second issue, it is announced that the determination has been arrived at to issue quarterly, as one of the main activities of the Fuel Department, the "Fuel Economy Review" of the Federation of British Industries; and it will be on sale to the general public at the price of 1s. per copy. The chief efforts of those responsible are to be directed to bringing before readers specific fuel problems and suggested solutions connected with works practice. The articles in the present issue are mostly of a practical nature, and include one on the "Economics of Coal Production," by Prof. Henry Louis, and another on "American Practice in the Purchase of Coal on a Calorific Basis." It seems that since the issue of the last number many inquiries have been made as to the class of work the Fuel Department are doing; and so some representative reports are epitomized. During the strike certain experimental work was carried out; and the results of this research, after approval by the Committee, will be published in forthcoming issues of the "Review." Readers have evidently much useful matter to look forward to.

REPORT OF THE GAS INCOMBUSTIBLES COMMITTEE.

THE report of the Carbon Monoxide Committee, which was given in last week's issue of the "JOURNAL," has been closely followed by that of the Departmental Committee on Gas Incombustibles—published yesterday [Tuesday] morning. The Committee were appointed in pursuance of the provisions of section 2 (4) of the Gas Regulation Act, 1920, to inquire into the question whether it is necessary or desirable to prescribe any limitations of the proportions of incombustible constituents which may be supplied in gas, and to report thereon. The members were Mr. James Hunter Gray, K.C. (Chairman), Mr. W. J. Atkinson Butterfield, M.A., F.I.C., F.C.S., and Dr. Cecil Howard Lander, D.Sc., M.Inst.M.E., Assoc.M.Inst.C.E. Evidence was taken by the Committee earlier this year; and a full account of what transpired at these sittings will be found in the numbers of the "JOURNAL" for Feb. 23 [p. 476], March 2 [p. 548], March 16 [p. 682], March 23 [p. 754], April 27 [p. 208], May 4 [p. 276], and June 8 [p. 561]. The witnesses called represented the Sheffield Gas Consumers' Association, the Railway Companies, the London County Council, the National Gas Council of Great Britain and Ireland, and the Gas Companies' Protection Association. Prof. R. V. Wheeler and Mr. George Helps also gave evidence. A written statement of evidence was placed before the Committee by the Association of Local Authorities Not Owning Gas Undertakings; but representatives of the Association did not attend to give oral evidence.

TO THE RIGHT HONOURABLE STANLEY BALDWIN, M.P., PRESIDENT OF THE BOARD OF TRADE.

SIR,—We were appointed by your predecessor, the Right Honourable Sir Robert Horne, G.B.E., K.C., M.P., under the provisions of section 2 (4) of the Gas Regulation Act, 1920, to inquire whether it is necessary or desirable to prescribe any limitations of the proportions of incombustible constituents which may be supplied in gas, and have the honour to present to you the report of our proceedings, conclusions, and recommendations in connection therewith.

INTRODUCTORY REMARKS.

2. Our terms of reference have been regarded by us as being circumscribed by the provisions of the Gas Regulation Act, 1920, according to which gas undertakings are authorized to charge only for the thermal units supplied, and are enabled to supply gas of whatever calorific value they prefer, subject to giving notice to their consumers of the calorific value to which they desire to work, and (in the case of alteration in the declared calorific value) subject to taking at their own expense such steps as may be necessary to alter, adjust, or replace the burners in consumers' appliances in such manner as to secure that the gas can be burned with safety and efficiency. In so far, therefore, as the presence of incombustibles in gas merely affects its calorific value, there is no ground open to us for recommending any limitation in the proportion of them in the gas supplied. The question thus resolves itself into an inquiry as to whether gas of any specified calorific value is reduced in its value to the consumer by the incombustibles which it may contain; and this involves investigation into the extent to which an increase in the proportion of incombustibles affects the fitness or efficiency of the gas for each of the varied uses to which it is put by consumers. Further, if its efficiency were found to be affected to a widely differing degree according to the use to which it was being put, it would be necessary to assess the relative importance and extent of the different uses of gas, in order to determine whether, in the interests of gas consumers as a whole, it were necessary or desirable to prescribe any limitations of the proportions of incombustibles. Moreover, if it were found that an increase in the proportion of incombustibles in gas specially affected a particular use of this commodity, it might be desirable to restrict the prescription of a limitation of the proportion of incombustibles to certain classes of gas undertakings in whose districts of supply that particular use prevailed to an unusual extent.

3. In accordance with the provisions of the Gas Regulation Act, 1920, and Orders made under that Act by the Board of Trade, a gas undertaking is at liberty to charge for gas of the declared calorific value a price which does not directly depend on the proportion of incombustibles or inerts contained therein; and the question before us was not, therefore, complicated, strictly speaking, by considerations of the relative economy of production and supply of gas containing a higher or lower proportion of incombustibles, so long as its calorific value remained the same. We could not remain oblivious, however, to the possibility that in the case of undertakings working on a sliding-scale basis, since the rate of dividend payable is dependent on the price charged for the gas supplied, a substantial lowering of the cost of supplying gas of a stated calorific value, due to an alteration in the methods of manufacture or distribution, would lead to a reduction in the charges levied on the consumer. Such a reduction in the charge might conceivably compensate him for some detriment which he might suffer through a consequential alteration in the proportion of incombustibles in the gas.

PREVIOUS INQUIRIES.

4. The question of the effect of incombustibles in town's gas had already been considered by the Fuel Research Board when, in the year 1917, they were asked by the Board of Trade and other departments concerned to advise as to "what is the most suitable composition and quality of gas and the minimum pressure at which it should be generally supplied, having regard to the desirability of economy in the use of coal, the adequate recovery of bye-products, and the purposes for which gas is now used."

On Jan. 29, 1919, the Fuel Research Board presented a report to the Board of Trade on "Gas Standards," wherein they recommended that gas undertakings should "be free to deliver to the consumer any mixture of the ordinary combustible gases free from sulphuretted hydrogen and not containing more than 12 p.ct. of inert constituents," and reference to the body of the report indicates that the Fuel Research Board were satisfied "that the imposition of a maximum limit of 12 p.ct. of inert gases would in no way curtail the legitimate freedom of choice of raw materials and methods of production by the producers, while it would reassure those consumers who have suffered in the past from the excessive introduction of inert gases."

5. Following upon the presentation of this report, and after consultation with the Board of Trade, a conference of representatives of producers and consumers of gas was called by the Fuel Research Board in October of 1919, in order that the Board of Trade might have before them the agreed views of both parties prior to the introduction of the new Bill for the regulation of the gas industry then in contemplation. The conference carried a series of eight resolutions, the fourth of which was: "That, subject to the acceptance by the gas undertaking of the stipulations laid down in Articles I., II., III., V., VI., and VII." (*i.e.*, of the report on "Gas Standards") "the gas undertaking is to be free to deliver to the consumer any mixture of combustible gases free from sulphuretted hydrogen, and not containing more than

20 p.ct. of inert constituents for two years.
18 " " " " " thereafter.
15 " " " thereafter."

The progressive reduction in the proportion of incombustibles was framed to give gas undertakings time to overtake arrears of maintenance arising out of war conditions.

This resolution was naturally a compromise between the conflicting views put forward. No sooner, however, had this understanding been reached than the managements of some gas undertakings became alarmed at the interference which it might involve in methods of gas supply on which they were embarking with the object of reducing the charge per therm to the gas consumer—such methods entailing a departure from the methods of production which the Fuel Research Board had regarded, in January, 1919, as likely to be economically desirable. At the same time, further experimental inquiry indicated that it was not so clearly established as had hitherto been supposed that the gas consumer would be seriously prejudiced by an increase in the gas of the proportion of incombustibles, for which he would not in future be charged. The gas industry proceeded at the time the Gas Regulation Bill was before Parliament to question the expediency of any limitation being placed on the proportion of incombustibles in gas, until their harmfulness had been proved by the results of more extended inquiry and experience, and in section 2 (4) of the Gas Regulation Act the validity of this contention was accepted.

ORIGIN OF INCOMBUSTIBLES.

6. The incombustible constituents—carbon dioxide, nitrogen, and oxygen—normally present in town's gas enter from several sources, and in proportions varying according to the method of gas manufacture adopted.

Carbon dioxide always results to a varying degree as a direct product of the carbonization of coal. The proportion present in coal gas is also dependent upon the condition of the walls of the retorts and the efficiency of the retort-lids. If the former are cracked or porous, or the latter are ill-fitting, the maintenance of a slight vacuum in the retort is necessary in order to prevent the escape of combustible gas, with the consequent entry of flue gases and air from the exterior of the retort. A proportion of carbon dioxide also originates in the manufacture of water gas—its magnitude depending on the efficiency with which this process is conducted. In gas produced by processes involving the complete gasification of coal, carbon dioxide occurs from most of the sources enumerated above; and in some systems of gas production in which it is proposed to utilize internal heating of the retorts further quantities of carbon dioxide would necessarily be produced.

Nitrogen is derived to a small degree from the nitrogenous

matter present in the coal substance; but greater proportions are derived from external sources somewhat similar to the carbon dioxide. In many instances a certain proportion is introduced into the crude gas deliberately in the form of air, the oxygen of the latter helping to revivify the oxide of iron used in the gas purifiers.

Oxygen is not, strictly speaking, an inert gas, although it is not in itself a combustible constituent of town's gas. It is usually present in town's gas owing to leakages into the retorts or from the air introduced into the purification system. Its presence reduces the amount of air which must be added at the burner in order to ensure complete combustion of the gas supplied.

EVIDENCE AVAILABLE.

7. In pursuance of the inquiry comprised in our terms of reference, we have held in all twelve meetings and have taken evidence from witnesses on behalf of the different classes of consumers of gas on the one hand and from representatives of the gas industry on the other.

The former were of opinion that some degree of restriction should be placed upon the percentage of incombustible constituents present in town's gas. The reason given was that analyses made from time to time had revealed that the consumer had been paying for somewhat high proportions of these diluents, the presence of which could, it was asserted, in many cases have been avoided. Under the new system of charging by heat units received instead of by volume, that reason for restricting the percentage of incombustibles no longer obtains, except in so far as the consumer may pay for heat units used in heating the incombustible gases to the general flame temperature.

8. It has been represented to us by large industrial users of gas that satisfactory operation of their furnaces has been very difficult or impossible to secure with the gas now supplied to them, containing a higher proportion of incombustible constituents than formerly. There appeared, however, to be insufficient evidence that the unsatisfactory results were due mainly to these constituents, and not to the lowered calorific value which usually accompanied them or to extreme variations in calorific value and pressure. In our opinion the evidence does not establish that reduction of the percentage of incombustibles *per se* would necessarily have produced the results desired.

9. We have been informed by another witness that the presence of a large proportion of incombustibles is inimical to the production of a steady flame in burners of the bunsen type, such as are used in industrial furnaces; and it was suggested that 15 p.ct. of nitrogen should be the maximum permissible in a "straight" coal gas or a mixture thereof with coke-oven gas, while with mixtures of coal gas and water gas a limit of as high as 30 p.ct. of nitrogen was suggested—this proportion having no more effect than 15 p.ct. in the case of "straight" coal gas. These suggested limitations are the outcome of theoretical considerations combined with experimental evidence on the velocity of flame propagation in tubes; and the witness stated that alteration in the form of burner used would have considerable influence on the results obtained.

10. So far as the use of gas for incandescent lighting is concerned, evidence was given of a number of tests made upon gases drawn from different parts of the country. These gases contained very different proportions of incombustibles. The tests appeared to indicate that, in many cases, any deleterious effects which the admixture of a high proportion of incombustibles might exert upon the efficiency of utilization of the gas are to a considerable extent—perhaps sometimes wholly—balanced by simultaneous changes in the proportions of the combustible constituents due to the latter occurring in the gas used for dilution in a ratio different from that in the original gas.

No conclusive evidence of an experimental nature has been forthcoming from consumers of gas to demonstrate that the addition of incombustible gases in general, in the conditions in which they might be expected to be added, if at all, under the new system of charging for gas by heat units, produces any serious detrimental effect upon the efficiency obtained by the consumer with his appliances, provided these are adjusted to suit the peculiarities of the gas in question, and provided the previous rate of supply of heat units is maintained.

11. It has been represented to us that an important reason for restriction of the percentage of incombustible constituents in gas is the fact that as distribution costs naturally increase, *ceteris paribus*, with an increase of the volume of the gas sent through the mains, the consumer will be called upon to pay a higher price for gas owing to the enhanced cost in question. This would appear to be an argument not without weight if there still existed any incentive to the supplier of gas to increase the volume of the gas supplied at the expense of its calorific value. But, under the new legislative provisions, increase of distribution costs due to deliberate or unnecessary dilution of the gas with incombustibles would hardly occur in the case of any undertaking conducted upon commercial lines, unless indeed the total combined costs of manufacture and distribution could be thereby reduced. With distributing plant in very many cases already heavily taxed to meet the demand made upon it, and having regard to the considerably increased initial pressure required for transmitting a larger volume of gas—probably also of higher specific gravity—through the mains, we are of opinion that in general incombustibles will be present only to an extent which economic considerations render imperative, and will not be deliberately added without some beneficial effect in view.

12. It appeared clear from evidence received on behalf of the gas industry that any harmful effect of the presence of incombustibles in general in gas is usually negligible for gas-engines and relatively low-temperature operations, and that in the case of gas-fires the deleterious effect is small even with a high proportion of such constituents.

13. So far as incandescent lighting is concerned, it has been stated in evidence by competent opinion in the gas industry that the admixture of a large proportion, such as 50 p.ct., of producer gas having a high percentage of incombustibles, with coal gas must necessarily result in decreased efficiency to the consumer as compared with gas of similar calorific value produced by dilution of coal gas with water gas. It was further agreed that a limit of 10 p.ct. of carbon dioxide would not be onerous to the gas industry under present conditions of working.

Some experiments have also been reported to us which indicate that, so far as high-pressure incandescent lighting is concerned, the addition of increasing quantities of nitrogen to ordinary town's gas renders necessary a greater expenditure of thermal units to maintain the same lighting effect; but the evidence was insufficient to prove that, with the conditions in which nitrogen would in practice be added—*i.e.*, with a variation also in the relative proportions of the combustible constituents—a serious reduction in efficiency would result.

14. We have received direct evidence with regard to the experiments conducted by the Research Sub-Committee of the Gas Investigation Committee of the Institution of Gas Engineers upon the effect of incombustible constituents on the efficiency of gas in use. We are satisfied (as already indicated) that, provided high proportions of carbon dioxide are excluded, the harmful effect of incombustibles is negligible in low-temperature operations such as water boiling, and is small in the case of gas-fires properly adjusted.

15. The experiments made in the realm of incandescent lighting indicate that, while a considerable proportion of nitrogen can be added to "straight" coal gas without material effect, a comparatively small percentage of carbon dioxide is harmful. The efficiency of the gas in use is, however, materially diminished when the percentage of nitrogen is further increased. The additions were made (save in the case of a few preliminary experiments) not in the form of fuel gases, as would usually be the case in practice, but of the incombustibles alone. From theoretical considerations it would not appear to be improbable that, in any commercial addition of incombustibles in considerable quantity to coal gas, the combustible gas simultaneously added—*e.g.*, in the form of producer gas or poor quality water gas—would tend to mitigate any harmful effect which a high proportion of incombustibles might otherwise exert. As already stated, evidence has been brought to our notice indicating that in some instances such is in reality the case.

The lighting experiments of the Research Sub-Committee were conducted in the main on upright mantles; whereas the tendency in modern lighting is undoubtedly towards an increase in the use of the inverted mantle. Here is introduced a further factor, concerning the effect of which very little evidence is available.

16. The limit of nitrogen suggested by the experiments of the Research Sub-Committee beyond which its effect becomes seriously detrimental, is higher than is likely to occur in practice in gas supplied on a therm basis of charge—at least according to present methods of manufacture. Bearing this fact in mind, and having regard to the considerations stated in the preceding paragraph, we are of opinion that, while the experiments in question are valuable as evidence that the addition of moderate quantities of nitrogen to straight coal gas is not seriously detrimental, they should not be taken as conclusive proof that under conditions of modern gas-works practice and incandescent lighting, the presence of a more considerable quantity of this incombustible is necessarily a serious factor against which to guard. These experiments, however, indicate that carbon dioxide is much more harmful; but the results are not entirely consistent, or so conclusive as to enable us to suggest a limit for this constituent at the present time.

17. It has been urged that the isolated instances which may occur in which gas containing a high proportion of incombustibles is supplied for public consumption should be dealt with (if it is considered necessary to make any restrictions at all) in an exceptional manner—*e.g.*, by the imposition of a maximum limit of incombustibles in the case of those undertakings declaring a calorific value below a certain figure. This would obviate the necessity for the making of continual analyses of the gas supplied by other undertakings in order to ensure that a given limit of incombustibles was not exceeded.

It would appear that the presence of air even in considerable proportion is not detrimental to the efficiency obtained by the consumer. With gas containing up to about 30 p.ct. of other incombustibles the consumer is apparently little if at all prejudiced, provided the calorific value is not below a certain figure—*e.g.*, 400 B.Th.U. gross per cubic foot, and the content of carbon dioxide is not excessive—*e.g.*, is less than 8 p.ct. The evidence before us suggests that such a limitation would not be onerous to the gas industry at the present time.

PRESENT DIFFICULTIES OF THE GAS INDUSTRY.

18. The rapidly increasing demand for gas in many districts,

combined with the high price of constructional materials and labour, the difficulty of obtaining coal of suitable quality, the inferior quality of the refractory material available, and the difficulty or impossibility of carrying-out repairs during the war period, render it difficult for many gas undertakings to maintain at present a consistently low level of incombustible constituents in the gas they supply, without going to such expense as would seriously raise the price of gas to the consumer. As already pointed out, leaky retorts necessitate either the loss of combustible gas or alternatively the leakage into the retorts of outside air and furnace gases. In some instances, inadequate purifying plant and insufficient space or other difficulties in the way of its extension, necessitate the introduction of an abnormal proportion of air into the purifiers to maintain the oxide of iron in an active condition; the alternative being the risk of incomplete removal of sulphuretted hydrogen from the gas. As a consequence, it is difficult to avoid a certain percentage of air in the gas supplied; and although the price may be slightly increased by the higher cost of distribution of the diluted gas, it may be anticipated that dilution by air, for which no charge can be made, will be kept within the lowest practicable limits, especially in those districts where the capacity of the mains is already severely taxed.

In this connection we may refer to the recommendation of one of the witnesses on behalf of the National Gas Council that any clause as regards incombustibles should be suspended for a period of years, at the end of which time the operations of the Gas Regulation Act would be better understood, and steps could be taken to enforce any necessary prohibition on the basis of acquired experience.

Possible Future Developments in Gas Practice.

19. The possible effect on future practice of a limitation of the proportion of incombustibles, even when that limit is (having regard to the present condition of the gas industry) a sufficiently high one, must not be overlooked. It is not inconceivable that future developments may render available to the industry a gas of high calorific value requiring, to facilitate its distribution and use, considerable dilution with low-grade fuel gases, of which the most readily available might contain a high proportion of incombustibles. Alternatively, gases of comparatively low calorific value having a high content of incombustibles may possibly become widely available from processes involving internal heating of the retorts. Without expressing any opinion as to the applicability of any of these proposals, it is evidently undesirable in the interests of the consumer that, if there is even a remote possibility of such processes proving capable of supplying him with a suitable gas at a low cost per therm, gas undertakings should by legal enactments be prevented from availing themselves of them.

Limitation by Specific Gravity.

20. Our attention has been drawn to the lack of any satisfactory method of automatically recording the percentage of incombustibles (with the exception of carbon dioxide) in town's gas, and the consequent expense to which gas undertakings and local authorities would be put in making continued and tedious analyses of the gas supplied, if a limitation of incombustibles were prescribed. The suggestion has accordingly been considered of the possibility of limiting the proportion of incombustible constituents by placing a limitation upon the specific gravity or variation of specific gravity of the gas supplied, since reliable recording gravity meters are available or might be readily produced. We are of opinion, however, that a limitation of incombustibles defined in this manner would be open to many objections, both with regard to its inferential nature and to possible future practice in the gas industry.

Conclusions and Recommendations.

21. Having regard to the considerations already set forth, we are of opinion that it has not been established in evidence that restriction of incombustibles is necessary or desirable at the present time as a safeguard of the widely varying interests of the gas consumer. It appears to us possible that stronger evidence might perhaps be put forward at a later date in favour of a limitation of the proportion of incombustible constituents in town's gas, or of certain of them, than has hitherto been done, either as a result of experience of the conditions of the gas industry after the new basis of charging has become general, or of a further experimental investigation of the question, or of both. At present, however, while the evidence appears to indicate that for certain uses the harmful effect of carbon dioxide is very considerably greater than that of nitrogen, it is nevertheless insufficient to enable us to determine at what point a limitation of the proportion of any or all incombustibles becomes necessary or desirable. In view of the fact that the gas industry is now passing through a transition period, we are of opinion upon the evidence before us that the present is not an opportune time to impose restrictions on the industry in respect of incombustible constituents.

22. We therefore recommend that at present no limitation be placed on the proportion of incombustible constituents in town's gas, and that after a period of three years, when the therm basis of charging for gas delivered has become general throughout the United Kingdom, and the difficulties under which some gas undertakings now labour are likely to have become mitigated, a further inquiry be instituted into the question comprised within our terms of reference.

23. In concluding our report, we desire to express our high appreciation of the very valuable assistance given to us by our Secretary, Mr. W. H. L. Patterson, throughout what has been a difficult inquiry.

(Signed) JAMES HUNTER GRAY (*Chairman*),
W. J. ATKINSON BUTTERFIELD,
C. H. LANDER.

W. H. L. Patterson, Secretary.
Aug. 12, 1921.

SIXTY YEARS AGO.

[From the "Journal" for August, 1861.]

Naphthalized Gas.—We are continually witnessing the revival, in different forms, of exploded schemes, which, after having for a short time attracted attention, and raised the expectations of speculators, sink into oblivion, to be again resuscitated, after a term of repose, and reproduced once more as new. Naphthalized gas is one of these ever-recurring illusions, which, like a revolving light, after shining brightly for a short interval, becomes dim and is extinguished, but again flashes out with renewed splendour, and in due time again disappears. After an obscurity of rather unusual duration, naphthalized gas has once more reappeared, and it now presents itself under the sanction of the United Kingdom Carburating Gas Company, Ltd., with a nominal capital of £60,000, and guided by four Directors, among whom figures Mr. E. C. Shepard, of electric-gas notoriety. The prospectus of the Company represents that the invention (?) increases the brilliancy of the gas, and economizes its consumption by about one-half; so that there would be a saving on each street-lamp per year of £2 3s. 6d. The Directors of the Company have succeeded in getting a paragraph inserted in "The Times," describing some experiments made with the "patent carburator" in Moorgate Street, under the authority of the Commissioners of Sewers, from which it would seem that 3 c.ft. of ordinary coal gas carburetted with naphtha gave a light equal to 5 c.ft. of the same gas not carburetted. The authority of Dr. Letheby is quoted in the prospectus as favourable to the process; and the results of several of his experiments are recorded, showing that, with good naphtha applied in proper quantity, the illuminating power of the gas may be nearly doubled. These experiments, however, point to the difficulty of maintaining an equal intensity in the light, and to other practical inconveniences that would attend the process of carburetting, assuming it to be attended with the effect of economizing the combustion of gas to the degree represented. The plan of naphthalizing gas has, indeed, been tried again and again; but, however great its seeming advantages have appeared on its introduction, experience has proved that these advantages disappear on practical application; and there is nothing in the patented method of applying it to encourage the hope of better success at the present time.

Mr. Flintoff Again.—We are afraid of wearying our readers by noticing Mr. Flintoff's doings in Scotland; for the fallacious statements and senseless abuse of gas companies which form the staple of his lectures are too gross to be worth replying to. Nevertheless, it must be admitted that they have produced considerable disturbance among gas consumers, and have given much annoyance to the gas companies in the North; and he has thus acquired an importance much greater than he deserves.

Metal-Cutting with Town Gas.

The results obtained in metal-cutting by the use of town gas and oxygen in comparison with oxy-acetylene are dealt with by Mr. W. M. Henderson, of the Pacific Gas and Electric Company, who conducts a department in connection with the "Gas Record" for the purpose of supplying information and solving problems arising in any branch of the gas industry. The oxygen cutting process is based on the principle that a jet of oxygen directed upon a previously heated spot of steel or wrought iron causes it to ignite, with the result that the metal, acting as its own fuel, burns-away rapidly in the form of iron oxide. The edge of the metal is first heated by a mixed jet of oxygen and any suitable fuel gas—such as acetylene, hydrogen, or ordinary artificial gas. The jet of oxygen is sufficiently strong to blow-away the iron oxide in front of it, leaving a clean cut through the metal. By maintaining an independent heating jet while the cutting jet of oxygen is travelling, the cutting operation is rendered continuous. The same style equipment is used in the oxygen cutting process as in the welding system, with the exception of the torch. The cutting torch admits the gases for preheating through two needle-valves, and has a special lever controlling the oxygen cutting jet. The cutting tip has circular slots for the preheating flame, which surrounds the orifice admitting the oxygen cutting jet. Having applied the preheating flame to the edge of the metal to be cut, bringing it to a red heat, the oxygen jet is admitted, and the metal burned away. He gives figures comparing the cost of the oxy-acetylene process with that of the oxy-town-gas process, much to the advantage of the latter. In addition, data obtained by recent experiments show that the speed of cutting was equal to, if not faster than, by oxy-acetylene; the period of preheating the metal was practically negligible in the consideration of time and gas consumption; and the "kurf" or slot cut by the oxygen jet was sharp, clean, and uniform—the width of the "kurf" being the same as with other processes.

ELECTRICITY SUPPLY MEMORANDA.

AN article appears in the current issue of "The Times Engineering Supplement," on "The Trade in Energy," from which it appears that the only energy within the field of vision of the "Electrical Correspondent" is that which is electrical. The writer thinks there will be as great progress in the years 1920-40 in the electricity industry as there is to be admired in retrospect for the years 1900-20. We see no reason why there should not be. But the anticipation is based upon the changed mental attitude that he sees in the industry, which is not the case with all people who think themselves discerning. However, the new mental attitude is more the product of a forced change than of the development of growing intelligence or an alteration of desire. This is seen as we read that parties who were violently opposed to each other at the advent of the power companies have been brought into alliance by a sense of growing danger. The only quarter from which "danger" is coming would seem from the context to be the State. While it is admitted that companies and local authorities have not abandoned all their mutual suspicion and distrust, they "hate the interference of the State more than they hate each other; and this is a good beginning for a closer approach." He finds that parties are now extraordinarily willing to co-operate in respect of generation, compared with the stupid exclusiveness of twenty or fewer years ago, when it was regarded as a sacred principle that each little township should be independent of cheap power from a better source than its own toy plant. Mutual suspicion and distrust has been one of the prominent features of the inquiries by the Electricity Commissioners; and we are afraid it is not on the wane to the extent the "Electrical Correspondent" fancies. However, the extent to which the new relationship has developed is apparently one aspect of the change in mental attitude. Another is the belief that the retail business is the best end of electricity supply. This belief is said to be growing, although not always readily perceptible. Of course, if electrical energy can be secured from any quarter at a cheaper rate, there is much more room for commercial and technical improvement in dealing with the consumer. Before this supposed change in mental attitude came about, the electrical engineer was believed to be a man who loved his machinery dearly, and traded with difficulty—finding consumer affairs quite uncongenial. But now the commercial spirit is brighter, and more active. Finally, a prophecy by "Electrical Correspondent." "What will characterize the new period of twenty years or so will be the carrying of wires into every ordinary house, and the use of electricity for all possible industrial and domestic purposes without further question." "Into every ordinary house," and "without further question!" In the background of this prophecy stands grimly the facts of the low efficiency of electricity generation, of the 3420 B.Th.U. per KW.-hour, of the expensiveness of electrical appliances and installations, and of an unreliability that does not attach to any other fuel agent. And, further, not even lump-sum primary payments, with a low secondary charge per unit, will hide the fact that heating operations by electricity are costly. The percentage of householders who will be able to pay the lump sum will be relatively small.

Changed Mental Attitude and a Prophecy.

Industrial Consumers.

Industrial consumers on the large scale are not an unmixed blessing. This is shown in an article in the "Electrical Review" on "Large Consumers and Local Authority Undertakings." The article is interesting, but its special purpose is not very clear. It points to the capital saving that manufacturers effect by becoming patrons of the local authority supply, instead of being their own providers of energy—the capital thus saved being utilized in their own businesses. This, of course, is only half the story. If there is a profit attached to home generation compared with the charges for lighting and power from local authority mains, then it is a good thing to incur the capital charges as part of the business. Moreover, in so many businesses, heat and steam have to be provided for purposes other than lighting and power; and, therefore, the provision of heat (by gas or other fuel) and steam is inter-related with the provision of light and power. In place of purchase from an outside source, it may be much cheaper (as it is in numerous cases) to go a step beyond heat and steam, and by electrical means provide light and power; and in this case there are no distribution charges or electrical losses beyond the limits of the works. The manufacturers must be the best judges as to whether they should themselves provide or purchase energy. There is a great deal of this home provision of energy going on to-day. Large-power gas-engines are being made and installed for the purpose; and the "Electrical Review" cannot teach the manufacturers their business in this respect. That is not, however, the main object of the article, if we interpret its intentions correctly.

Dangers, and Who Pays.

The main object is to point out that there are disadvantages as well as advantages in the industrial load. Many electricity undertakings have contracts for the supply of industrial energy that do not pay nowadays whatever they did in the old normal pre-war days. These contracts, where the charges cannot be altered, are not an advantage to the business to-day. Of course, an industrial business enjoying a good load factor is an advantage to an electricity undertaking in times of sound trading conditions; and it is then worth something to get the business—always provided (adopting the words of our contemporary) "the big consumers' price covers the proper share of capital charges and working expenses, the small consumers may be positively benefited." There is the danger that in the bargaining to get hold of these big consumers the manufacturers will get the best of the bargain, and that their payments will not cover all charges. The charges certainly do not possess in some areas the necessary covering power in days of coal stoppages, big slumps in trade, and short production. Heavy capital expenditure has been incurred for the provision of the energy for these industrial establishments; and in some cases in these times there is little or no consumption. Nevertheless, the capital charges are running on; and who pays? Not the consumer whose maximum industrial demand has occasioned a large capital outlay for generating plant, and whose demand now is of a low order; but the money to meet the capital charges has to be provided by the smaller consumers in the district. If there is a deficit—part or all of which is due to the lapse of industrial business, but not lapse of capital charges for meeting the maximum industrial demand—an increase of charge is made upon those who are consumers, unless the money is filched from the pockets of the ratepayers. The "Review" commenced its article by saying that in certain of our big industrial towns a rather curious position is developing, as between the local purveyors of electricity and the big manufacturers. It is so. Another danger in municipal electricity administration to which our contemporary points is the undue favouring of manufacturing friends; and even the political views of a manufacturer may assist him in obtaining electricity at a price which will not advantage the rest of the consumers. The "Review" suggests that these conditions seem to require some superior authority to see fair play as between one class of consumer and another. It suggests that the Electricity Commissioners or Joint Electricity Authority might take up such work. However, it is clear that the industrial load can be an advantage to the small consumer, and equally it can be a burden—either through insufficient charging, or when maximum demand is not being exercised, or there is little or no demand at all.

A Private Plant and Cheap Energy.

In the succeeding pages of our contemporary, there is a case in point, where it is distinctly of advantage to a manufacturing firm to be their own electricity producers with waste fuel. The illustration is from the works of Messrs. John Sadd and Sons, timber merchants, of Maldon, Essex, who utilize their waste wood and sawdust in gas-producers for gas making and generating current by gas-engines. The initial experience was gained in 1910 from two sets of 100 H.P. waste-wood refuse gas plant, and two horizontal single-cylinder gas-engines, direct coupled to the dynamos. Although only wood refuse is used, very little difficulty is experienced with the gas-producers, and the gas is of excellent quality. Wood tar is produced, and fetches £1 per barrel. The wood ash is also a valuable fertilizer, and has a market value of £3 per ton. The firm uses 50 motors, aggregating 668 H.P.; and they supply current for lighting and power to Maldon and the adjoining village of Heybridge. The average cost of production is 1·351d. per KW.-hour; and when normal conditions are resumed, the figure will approach 0·75d. "It should also be mentioned that energy is being supplied to consumers on much more favourable terms than are quoted in other districts." And this is a private plant run by a manufacturer, with all the capital expenditure attached. It is only an instance of what can be, and is being, done in industrial works, and, all costs included, at a cheaper rate than would be the case by taking a supply from the public cables.

A Local Company for Developing Sales.

The electricity people, as seen by recent references to the matter, are devoting themselves energetically to schemes for the sale and hiring-out of appliances. The newly acquired hiring-out powers that local authorities running an electricity business have secured under the Electricity Supply Act, 1919, have no doubt put new energy into them, and there is a desire now to make the most of the long-sought-for authority. At Croydon, quite a novel venture has been proposed. The electrical contractors who have showrooms have had it suggested to them by the Corporation Electricity Department that they should form themselves into a private auxiliary company for the purpose of selling apparatus from the Corporation showrooms. The Department would pay all the advertising expenses in future business-getting campaigns, would sell apparatus, and hold demonstrations; and the whole of the profits from sales of the apparatus would be equally divided among those contractors who wish to join in the scheme. Naturally, there is a little diffidence among the contractors, owing to the fact that such sales would more or less reflect on their individual businesses. The Croydon Electric Heating Company have offered to supply to the proposed Company electric-irons on sale or return; and one of the leading motor manufacturing firms have submitted a scheme of hire-purchase. The Company is almost formed. The repairs that come in will be handed over to the Electric Heating Company, who will un-

questionably have a good business in this line if many appliances are sold. It is thought there are enormous possibilities in this collective effort on the part of the contractors.

A Hire-Purchase Scheme.

The hire-purchase of electrical appliances is another favourite line of development. It was practised in Beckenham in other and more congenial days; it is now being revived. From the "Electrical Times," it is seen that consumers will be able to purchase new installations wired by the Council (the maximum sum allowed in respect of any individual installation under the scheme, including part cost of service, is to be £25), on a cash payment of 20 p.ct. of the total purchase price, and the balance by quarterly instalments spread over a period not exceeding three years, with interest on the amount outstanding at ½ p.ct. per annum above Bank rate. Domestic appliances will be sold under the same system, though in such cases payments are spread over twelve months only. So short a period suggests rapid depreciation, and early repair and probably dissatisfaction.

The Radiator a Degenerator of Load Factor.

It is very difficult to get all electricians to look some facts squarely in the face. They have been trying to develop the electric heating business, and are still playing about the fringe of it. With prices what they are, they have been forced to admit that electric heating is only suitable for occasional use, or to take the "edge" off the drooping temperatures in rooms in the autumn or the spring. Even for these purposes it is an expensive form of heating. B.Th.U. electrically generated are very costly. In residential districts where there is no, or practically no, power load, it is questionable whether it is worth while attempting to develop this business at all. The point is made by Mr. A. H. Dykes in a letter to "Electrical Industries." He finds that radiators are used principally in the evening during peak load, and on an average only one or two months in a year, and then for a very short time each day. Their load factor is not better, but worse, than the lighting load. It is perfectly obvious, therefore, if to make the lighting load pay it is necessary to charge 1s. per unit, it cannot be a profitable piece of business to put in a large transformer, and supply current for heating at a worse load factor for 2½d. per unit. Mr. Dykes says he can speak from experience of a municipal undertaking that has had to face putting down additional plant in order to meet a peak which occurred during cold days last winter, due to the general use of radiators switched-on during the peak, and, on the whole, employed for a very few hours during the year. Had this power been used for supplying additional lamps giving a better load factor and a higher price per unit, the receipts would have been many times greater. There is among electrical men a tacit admission to-day that electric radiators are things that cannot be conscientiously pushed at present prices of energy; and where their use means the degeneration of the load factor, then they had better be left severely alone.

Fuel Used for Generation in America.

The United States Geological Survey has been busy tabulating some data for approximately 3000 public utility power plants, running from the low capacity of 100 KW. upwards. From the figures it appears that the average daily output of electricity for each month of 1920 ranged from 115 600 KW.-hours in May to 124,000,000 KW.-hours in January—the average for the whole year being 120,000,000 KW.-hours. The proportion of this output resulting from water-power varied from 33 p.ct. in January to 42 p.ct. in May. The total production for the year was 43,900 million KW.-hours—an increase of 12·9 p.ct. over 1919. Water-power supplied 37½ p.ct. of this total, or practically the same proportion as in 1919. The amounts of coal, fuel oil, and gas employed to generate electricity in 1920 respectively increased by 6, 18·4, and 13·6 p.ct. over the preceding year. If the fuel oil, gas, and wood used in generating electricity were converted into the equivalent amount of coal, the coal consumption would have been 38,500,000 tons in 1919 and 41,200,000 tons in 1920—an increase of 7 p.ct. This increase in the amount of fuel burned was, however, accompanied by an increase of 12·9 p.ct. in the output, indicating a much more efficient consumption of fuel in 1920. On the basis of the equivalent coal consumed in each of the two years, the public utility plants burned 3·17 lbs. of coal in 1919 to produce 1 KW.-hour of electricity, and 3·01 lbs. in 1920. This is a better average than our plants would show at home; but, of course, the figures are not better than individual modern plants can claim. The American engineers will naturally say their "average" fuel consumption does not disclose their best working.

The annual general meeting of the Institution of Mining Engineers is to be held on Wednesday, Sept. 14, in the Town Hall, Stoke-on-Trent. One of the papers to be submitted is on the "Adsorption or Solubility of Methane and other Gases in Coal, Charcoal, and Other Substances," by Mr. J. Ivon Graham, M.A., M.Sc., Chief Chemist of the Doncaster Coalowners' Laboratory. A number of excursions have been arranged for the two following days. The address of the Institution has been changed from Victoria Street to Cleveland House, No. 225, City Road, E.C.

PRACTICES IN THE CROYDON WORKSHOPS.

Old Appliances Made Equal to New.

THE article published a fortnight ago, on the enamelling of gas-fires in the workshops of the Distribution and Sales Department of the Croydon Gas Company, did not exhaust the interest the writer found there. They are lofty, airy, and well-equipped shops; and they are run so as to make them pay.

OVERHEAD CHARGES.

This is not the case with all workshops. Some gas engineers, we are afraid, are too economical in their estimate of overhead charges, and so do themselves an injustice as well as the manufacturers who ought to get work that cannot be so economically done at home as they can do it. When work is carried out at home—all costs included (capital and everything else)—that can be done cheaper elsewhere, then it is not an economical proceeding. No man does anything in these workshops of the Croydon Gas Company without a cost-card. The time occupied, material used, and the costs are, by the aid of these cards, ascertainable to a fraction; and Mr. W. J. Sandeman, the Distributing Engineer and Sales Manager, is satisfied that 100 p.ct. should be placed upon time costs, and 10 p.ct. upon material, to cover all items which are comprised within "overhead charges." Some engineers will say he is very much on the safe side, and that a lower addition will suffice. But the writer found Mr. Sandeman firm in his conviction, from long and complete investigation of the subject, that his was a safe, but not an over, estimate. However, on this basis, and with all the items of cost available, it is known exactly what can be done and what cannot be done at a profit. What it is not possible to do with profit, if the time factor is not important, is passed on to those who can do it at a lower price. But a gas undertaking of the size of that at Croydon supplies an amplitude of work, of almost infinite variety, which with business developments is extending, as seen from the fire-enamelling article published recently. The major part of the work deals with consumers' appliances, but the outdoor department's own working equipment also contributes its share of the demands upon the shops.

SAND-BLASTING, CLEANING, AND SPRAYING FIRES, COOKERS, &c.

In the various shops, the writer saw in progress a large amount of cleaning, repairing, and renovating of gas cookers, fires, geysers, boilers, boiling-rings, and so on. When a renovated cooker or fire is turned out of the shops, the ordinary consumer cannot possibly know he has not got a new one. It requires an expert to see the difference—if any really exists. It is because of this that the Company do not have to carry a large stock—practically all the stock required is to meet the extensions of business or purchases by consumers. The renovating work is done with a minimum of labour, and economically.

Attention was first turned to the cooker work. We ought to preface this by saying that the Company only run two types of cookers—of course, of different sizes. They are now considering the question of adopting a front tap-rail, in view of the number of recesses they are fitting in kitchens. This by the way. A dirty cooker sent to the shops, it is seen, has first the brass work removed, and is then placed in a muffle, where it is subjected to a temperature of 600° to 800° Fahr. This effectually destroys all grease. The cooker is allowed to cool-down after being removed from the muffle, and is then subjected to the sand-blast. This obviates the necessity for brushing with wire brushes, and does away with the consequent dust and dirt in the shops. The casting is also cleaned much more perfectly. Of the alternative methods of treating dirty cookers—in a muffle or boiling in a solution of caustic soda—Mr. Sandeman, having tried thoroughly both methods, infinitely prefers the muffle. The brass work taken off the dirty cookers is first treated in a caustic soda bath, and afterwards finished in a solution of nitric and hydrochloric acids. The result is that they come out of the cleaning process like new. For sand-blasting, there is also a preference here, and a well-substantiated one in view of economy of labour and efficiency. It is infinitely better than the old process of cleaning with wire brushes. There are other gas undertakings that have the same preference for sand-blasting. But not all have tried it; and some responsible officials have not even seen the effect. Every part of a cooker (save the brass work) and the castings of fires which are in for repair and renovation, are subjected to the sand-blast. It is not surprising. The body of a cooker was seen sand-blasted, and every crevice was perfectly cleaned. The sand-blast penetrates and removes. Like the body, the cooker-bars came from the operating chamber as clean and new-looking as though fresh from the foundry. The same air-compressor that supplies air to the smithy, for the fire-enamelling work and other purposes, furnishes it for the sand-blasting operations. After the sand blasting, the cooker is sprayed with a coat of ordinary cooker black.

As was seen from the recent article in the "JOURNAL," the gas-fires that are brought in for repair and renovation are dealt with in an equally thorough manner; an extension being the enamelling in art colours, or bronze or armour-bright finishes to suit the requirements of consumers. This latter is a very popular and highly promising business. If the fires undergoing renovation are to be kept black, then over the makers' finish (if the coating is in sufficiently good repair) there is applied the black translucent

enamel which gives the fire-casing a bright and pleasing appearance. The complete renovation enables sales to be made of fires which would otherwise be unsaleable. The spraying is very effective. It is better than hand work. The paint gets well into every crevice, the surface is clean and smooth, and there is no running. The fire enamelling work results in other paying jobs to please consumers. The Company are out to make themselves useful within legitimate limits to those who patronize them. For instance, the writer saw a bath cleaned and with the priming on it. Mr. Sandeman explained that the Company undertake hot-water installations throughout, and have displaced many coal-heated water-circulating systems. When they do this, they finish off the work thoroughly; and, if necessary, even baths are taken out and re-enamelled.

BOILERS AND GEYSERS.

There were seen circulating boilers under repair, and old geysers being made equal to new. Given a sound geyser casing, a new inside, with all the connections, can be provided by the Company. A polishing-machine was seen in operation; and the casing of a geyser was by it, being brought to a condition which would vie with many an exhibition geyser. The front edge of a cooker top-plate was also being given that bright steel-like appearance which assists in persuading consumers to take care of, and to polish-up, their cookers.

TESTING.

Before leaving the shops, all cookers, fires, and geysers are tested to see that their connections are perfectly gas-tight, and the burners, &c., properly adjusted. The pressure employed is 35-10ths. Domestic boilers are tested to 50 lbs. pressure, by a hydraulic pump.

OXY-GAS WELDING.

Fractures in the casings of gas-fires or other parts of appliances do not render them derelict and useless. The repairing work extends to oxy-gas welding. A fractured gas-fire casing that had been repaired by this process was inspected. It had been re-enamelled; and there was no sign of any repair on the surface. One had to look at the back of the casing to locate something which had been an ugly break.

SHEET METAL SHOPS AND EX-SERVICE MEN.

The writer has not attempted here to describe the shops and all the work that proceeds in them, but merely to chronicle certain points of practice that particularly attracted him. Before leaving, interesting time was spent in the sheet metal shops, the work in which can be done by men seated at the benches. Therefore, for the work that goes on here (and a large amount can be found, not only through repairing operations, but for stock provision) Mr. Sandeman has had injured ex-service men trained. He has found them quick and apt at learning the trade—in fact, a few weeks suffice. These men are turning-out goods to-day which would do credit to men of long experience, and are quite happy in their new occupations. We examined sheet-metal meter-shelves, baffles for geysers, galvanized ceiling and wall plates for flue-pipes, straight flue pipes and flue-pipes elbowed to different angles, and of different diameters. They were all true, and the finish was of high merit. Street lantern repairing was also being done by a man who before the war and before his training had no knowledge of the work. There is no sign of the novice about him now. His work certifies efficiency. A note was made, too, of the small amount of scrap there was in the shops. The remnants are put to all sorts of useful purposes—among them all the stove badges are made out of odd bits of metal. Nothing is wasted; and scrap might almost truthfully have *nil* written against it. A good practically qualified superintendent of the shops, and men interested and all working well together in a good organization, mean economy. The writer spent a very profitable afternoon in the shops.

"ALL-GAS" KITCHENS.

Incidentally, speaking of some of the special lines of work the department carries out, Mr. Sandeman mentioned that, in the Croydon Company's area, they had taken out hundreds of coal-heated kitchen apparatus, and had put in complete gas-heated installations, including water-circulating systems. Locating the apparatus in a tiled recess makes a fine and attractive job; and people are so pleased with the result, that they are the best advertisers of the "all-gas" kitchen.

BONECOURT BOILERS.

Good business it is hoped will be done with these in the Company's area—anyway, the inquiries that are being made justify present hope. The increased efficiency and the consequent fuel and time saving means money. One laundryman in the Company's district calculates that his Bonecourt boiler has enabled him to increase the working capacity of his laundry by a day per week. This is excellent testimony.

A visit which will occupy the whole day has been arranged for the members of the Manchester and District Junior Gas Association, on Wednesday, Sept. 7, to the Mellor and Bredbury works of the Ramie Company.

At a recent meeting of the Privy Council, the petition of the Institution of Electrical Engineers for a Royal Charter of Incorporation was approved; and a Royal Charter has now been granted. The King has also been pleased to intimate his willingness to become patron of the Institution.

A GRIEVANCE ADJUSTER.

By A. CANNING WILLIAMS.

"Tact is the unconscious mental touch, the *tactus eruditus*, by which one mind feels another."—Dr. A. T. SCHOFIELD.

IT was with considerable interest that I read in last week's "JOURNAL" (p. 441) the paragraph headed "A Gas Company's Grievance Adjuster." It is beyond doubt that there has been a great improvement during the past decade or two in the attitude of gas suppliers towards their consumers, in the matter of grievances; but there is still, I fear, a good deal of curtness extant. This may not do much actual harm where gas has no competitor; but in districts where electricity is supplied, it is distinctly harmful. Many a man, for example, who has been half-inclined to use the electric light has made up his mind to do so owing to discourteous treatment from some member of the gas company's staff. Nor does the mischief stop there. It is one of the weaknesses of human nature for a man or a woman with a grievance—real or imaginary—to become loquacious about it; and in the passing-on of the grievance from one to another, it grows to enormous proportions, and helps to keep alive the feeling of distrust of gas undertakings which exists in the minds of many otherwise sensible people.

The system of dealing with complaints by correspondence, or by men at the counter who are not temperamentally fitted for the delicate task, or who are made "short" by the sight of impatient consumers waiting to be attended to, is not one to be recommended. Unless composed by tactful and practised hands, letters in reply to complaints, even when well-meant, often convey a wrong impression, and so add to the consumer's irritation. It is so difficult for the writer to put himself in the position of the complainant, and look at things from his point of view. Again, the writer may have many other matters to see to of more pressing, if not of greater, importance; and he may also, from past experience, be inclined to treat all complaints as unfounded. Hence he has neither the time nor the desire to devote much attention to any one of them. The following letter, for example, was not meant to be "sharp," but brought a very angry reply:

> I have received your letter of yesterday. It is manifestly out of the question for me to explain how the gas was used. Section 20 of the Gas-Works Clauses Act, 1871, provides that "the register of the meter shall be *prima facie* evidence of the quantity of gas consumed, and in respect of which any rent is charged and sought to be recovered by the undertakers." The meter is there to record the gas that passes through it. If you allege that the meter registered "fast," it can be tested by the Public Inspector of Meters; and if he reports that such was the case an allowance will be made, my company bearing the expenses. If, on the other hand, he certifies it to be correct, the expenses of removal, testing, and replacing must be paid by you. If you should decide to have the meter tested, please sign and return the enclosed form. I ought, however, to warn you that meters condemned as inaccurate are usually erroneous to so small an extent that the allowance or surcharge, as the case may be, is usually of a very trifling amount.

Some such communication as this would have been more likely to soothe the consumer's savage breast:

> I have received your favour of yesterday, and much regret that you should consider the account excessive. It is possible that the inspector made a mistake in reading the index of the meter, or there may be an escape of gas. I will, therefore, give instructions for a representative of the company to call upon you on ———day next, the —th, at ——— o'clock. If the day and time mentioned will be convenient for you, do not trouble to reply; if not, kindly state on the enclosed postcard when you desire him to call.

The inspector (one chosen for this special work on account of his possessing a conciliatory manner and a personality that inspires confidence) waits upon the consumer; reads the meter; mentions the value of the gas used since the quarterly reading; tests the pipes; inspects the gas appliances; and so on. If these steps should lead to no explanation of the alleged excessive charge, the inspector would convey this politely to the consumer. In many cases the latter would reply: "Well, I suppose it must have been used." She—for it is usually the lady of the house who complains—might even add: "My last maid was certainly careless with gas," or: "We had illness in the house and used the gas-fire in the bedroom a good deal." When statements like these are made, the inspector leaves the house with a smile, well knowing that the account will be paid without further trouble.

In other cases, however, the consumer makes accusations against the honesty of the meter. The inspector would then point out that there is an official in the town whose business it is to test gas-meters independently of the company; and that if he should certify that the meter is "fast," an allowance will be made, and the expense connected with the test will be borne by the company. He also warns the consumer that meters as often register too little as too much, and that, in any case, the percentage of error is usually very small. If, in spite of this warning, the complainer insists on having the meter tested, the inspector obtains his signature to a printed form; and there the matter ends as far as he (the inspector) is concerned.

On the other hand, the inspector's examination may have revealed an escape of gas—possibly a serious one—in an attic or

loft which may not have been entered for weeks or months. In such a case, an allowance (determined, of course, by the head of the department) on the ground that the consumer was not aware of the existence of the leakage, would solve the difficulty. In the "Journal" for Oct. 26, 1909, Mr. T. Ebenezer Pye had some wise words on the subject of special allowances. They appeared in an article entitled "Militant Gas Consumers, and Others."

In the majority of gas undertakings, the number of grievances is not sufficient to warrant the employment of a whole-time "adjuster;" but there is little doubt that it would pay the larger concerns to have in this capacity, and at a good salary, a gentleman with the gift of touching and handling with nice discrimination and skill. He should be provided with a handsomely furnished room, alike for its influence upon his own and his caller's temper; and he should even be permitted, upon fitting occasion, to offer to his visitor, according to sex, a cigarette or a cigar. The effect (I write from experience) is immediate. The consumer who has exhibited wrath at the counter or in his letter, changes, as if by magic, into a reasonable being, and, if handled properly, from an enemy into a friend.

RETORT HEAD STANDARDS.

The report of the Manufacture Committee (Commission de Fabrication) of the Société Technique du Gaz, which was presented at the recent congress held at Tours, concerned itself chiefly with recommendations respecting the dimensions to be adopted for the heads of horizontal retorts and for the component parts thereof. The retorts themselves are of the following standard sectional dimensions:

(1) 640 by 350 mm. (flat-bed retorts).
(2) 640 by 360 mm. (convex-bed retorts).

The dimensions for the corresponding retort heads are:

(1) 650 by 360 mm. (for flat-bed retorts).
(2) 650 by 370 mm. (for convex-bed retorts).

A play of 5 mm. is thus allowed for the head, as rendered necessary by the deformation of standard retorts in manufacture. The depth of the head should be such that a space of 180 mm. is available for the ascension pipes.

It is recommended that the transverse bar and its catch should be fixed with bolts. The flange of the head should as a rule have a thickness of 20 mm.—the bolt holes corresponding exactly in position with those on standard retorts. The rim forming the seal with the door should have a thickness of 25 mm., sufficing for its surface being planed four or five times, on the basis of an average removal of metal of 2 mm. The body of the head has a thickness of 15 to 20 mm. in the lower portion. Its material is grey cast iron.

The door is preferably of the well-known curved pattern. A rib across the inside surface is not recommended, since it is found that, without it, doors are of ample strength, and moreover are more readily cleaned. The socket pattern of transverse bar is preferred; its mounting being attached to the rim of the head by bolts. A couple of shoulders are provided to bear against the sides of the head, for the purpose of relieving the strain on the bolts. These, as also the bar itself, are of cast steel.

The lever bar is mounted on its axis through a square aperture, and is kept in place by a standard screw-nut. These parts are of forged steel. The catch for the bar is of the ordinary pattern, machined for attachment to the head by bolts. To fix the door on the transverse bar, the Committee adopt the usual pattern, in which an eccentric bolt is fastened by means of a pin.

The Committee refer briefly to the question of the complete gasification of coal, in reference to the communications in England of Mr. George Helps. While recognizing the importance of this programme and the associated system of selling gas at a price per therm, the Committee have not yet had sufficient opportunity of studying the question in detail to justify a report upon it.

Brief reference is also made to the mechanical discharger of M. Nerrière,* which has been found to give most satisfactory service in many works of small size. A prize of 1000 frs. is awarded to M. Nerrière. The Aubertin-Aube producer has been the subject of preliminary study; but a report upon it is deferred until next year's Congress.

* See "Journal," Feb. 25, 1919, p. 395.

Gas in the Tobacco Industry.—How largely gas enters into modern practice in the tobacco industry can be gathered by a perusal of No. 90 of "A Thousand-and-One Uses for Gas," in which the British Commercial Gas Association have collected a great deal of valuable information, which is accompanied by many photographs. The various artificial heating and drying processes which are necessary for the finishing stages in the treatment of tobacco are explained. Then the tobacco has to be tested for moisture content; and after this the manufacture of the boxes and tins which are to contain the finished article has to be undertaken. The printing of the labels and the sealing of the labelled containers follows. In all these processes, gas is becoming the generally accepted heating agent in well-equipped tobacco factories—a fact which will hardly surprise anyone who carefully studies the facts and photographs to be found in the publication referred to.*

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Programme of the Forthcoming Meeting.

Under the presidency of Mr. James Dickson, of Johnstone, the Annual General Meeting of the Association will be held in the Lesser City Hall, King Edward Street, Perth, at 10.30, on Thursday, Sept. 8.

After a welcome by Provost Wotherspoon, the annual report and accounts will be submitted, new members will be elected, and the President will deliver his address. This will be followed by a paper by Mr. J. W. M'Lusky, of Glasgow, on "Consumers' Commonest Complaint;" and after a break for lunch, the William Young Memorial Lecture will be delivered by Mr. W. Newton Booth, B.Sc., of the Royal Gas Factory, Woolwich Arsenal, who will take for his subject the "Application of Scientific Methods to Increasing the Efficiency of the Gas Industry."

The same evening there will be a reception in the City Hall by the Provost, Magistrates, and members of the Perth Corporation; and for the following day a circular char-a-banc tour has been arranged, with luncheon at Blairgowrie.

ANNUAL REPORT.

The following extracts are taken from the annual report of the Council for the year 1920-21.

Membership.

The membership of the Association on June 30, 1921, was 256, as compared with 261 at the close of the previous year—a decrease of 5.

The following applicants for membership have been passed by the Council, and are recommended for election at the annual general meeting: Ordinary Members—Messrs. James M'Nair, Holytown; John Smart, Monifieth; Edward Edison Stones, Glasgow; and Walter Wilson, Stewarton. Extraordinary Member—Mr. Campbell F. Dunlop, Glasgow.

The Council recommend that, in view of his services to the industry and the Association, Mr. J. W. Carmichael, late Engineer to the Barrhead Gas Company, be elected an honorary member of the Association. [In the obituary column on another page the death of Mr. Carmichael is recorded.—Ed. "G.J."]

Institution of Gas Engineers' Delegate.

Mr. James Dickson, Johnstone, has been appointed to represent the North British Association of Gas Managers on the Council of the Institution of Gas Engineers, for the year 1921-22.

Commercial Sections.

Western District.—The past year has been one of great difficulty for all responsible for the management of gas undertakings; and the large attendance at each of the monthly meetings has shown that the members of the section welcome these opportunities of exchanging views and information, and conferring together on the many problems which have arisen. All the eleven meetings have been held in Glasgow; and Mr. James Bell, Gas Engineer, Dumbarton, has made an extremely capable Chairman. The coal strike, which lasted for thirteen weeks, and is only now ended, caused nearly all gas-works to be in serious difficulties through shortage of fuel. The section took action regarding the importation and distribution of coal from America; and this saved the situation for many members. David Fulton, Hon. Secretary.

North-Eastern District.—The past session has been one of extreme difficulty for all gas managers, but particularly for those of this district. The members are so far separated from each other that the cost and difficulties of travelling prevent them meeting as often as they would wish. During the period under review, four meetings were held—viz., at Perth, Burntisland, Dundee, and Dunfermline—with an average attendance of eighteen. A fifth meeting was arranged for, but had to be called-off owing to the strike. Recent months have proved extremely trying. The latter end of 1920, when residuals were ruling high, was followed by a sudden and unexpected drop; and then came the coal strike, with all its attendant trouble, which we are still in the midst of. Little or no coal was to be had, and any that was available was practically of no value and at an exorbitant price. The arrival of foreign coal proved a godsend to those who were fortunate enough to get some of it; and measures were taken to distribute as much as possible to the most needy works. As it was, we regret to say that some gas-works had to shut-down, as no coal could be got in time.

R. S. Johnstone, Secretary.

Official Analyst's Report for the Year.

As Official Analyst to the Association, Mr. G. H. Gemmell, F.I.C., reports that he received during the year various samples for analysis; and he gives the following details:

Sulphate of Ammonia, ... 34 *samples.*

Strength.—Maximum, 25·76 p.ct. ammonia—99·98 p.ct. sulphate of ammonia.
Minimum, 23·63 p.ct. ammonia—91·73 p.ct. sulphate of ammonia.
Average, 25·16 p.ct. ammonia—97·67 p.ct. sulphate of ammonia.

Moisture.	Free acid.
Maximum, 8·00 p.ct.	Maximum, 0·78 p.ct.
Minimum, 0·06 p.ct.	Minimum, *Nil.*
Average, 1·94 p.ct.	Average, 0·20 p.ct.

He has also made an examination of ammonia plants and liquors, to ascertain where loss of ammonia was taking place. He has carried out a series of experiments to determine by laboratory methods the power of various oxides to absorb H_2S, and the total amount of sulphur they were capable of absorbing, and also a series of experiments with an Orsat apparatus, in an attempt to simplify the methods of gas analysis.

FINANCIAL REPORT.

The increased rates of annual subscription passed at the annual general meeting in September, 1919, took effect on July 1, 1920, and there has been an increase of £78 in the income of the general fund from subscriptions. Entrance fees from new extraordinary members show a reduction of £20. The cost of printing, in spite of the exercise of economy, has again absorbed an undue proportion of the Association's income. The net result of the year's work has been a credit balance of £23, as compared with a deficit of £35 last year. The Council have decided to apply this sum to the reduction of the amount owing to the William Young Memorial Fund.

During the year ended June 30, 1921, no application for assistance from the Benevolent Fund was received. The total amount at credit of the fund is £974.

Voluntary subscriptions to the Research Fund reached the satisfactory sum of £17; and the credit balance in the bank is £11. The Council trust that members will continue to keep in mind the needs of this fund. The small sum of 1s. per member keeps it in a solvent state.

There was no expenditure from the William Young Memorial Fund during the year. The sum still owing this fund from the General Fund is £37.

RULES AND CONSTITUTION.

At the last annual general meeting there was apparently an opinion shared by several members that the Rules and Constitution of the Association required revision. The Council have given the matter consideration at their various meetings, and are of opinion that the rules generally are sound, and meet the requirements of the Association satisfactorily. Certain minor alterations have been agreed upon; and a Sub-Committee of the Council are at present handling the matter. They are, however, not yet prepared to make their final report, as the long-continued coal strike has, unfortunately, curtailed the opportunities for meetings.

The alteration in the method of electing members of Council passed at the last annual general meeting, is now included in the Rules and Constitution.

SPRING MEETINGS.

The Informal Meeting of Scottish Gas Managers is now incorporated in the spring meeting of the North British Association. The Council are of opinion that the holding of two meetings per annum will increase the power of the Association, and also its value to the members.

At the last annual general meeting, Mr. J. W. Napier was presented with a grandfather clock, and a diamond ring for his wife, on the occasion of his retirement from the Convenership of the Informal Meeting of Scottish Gas Managers. These gifts were subscribed for with goodwill by the members and friends.

The M'Gilchrist Memorial Chain has been handed into the custody of the Association; and the names of past Chairmen of the Informal Meeting will be engraved on the medallions whenever the state of the Association funds permits of the work being done.

ANNUAL STATISTICAL REPORT.

After careful consideration, the Council have decided unanimously to recommend to the annual general meeting that the publication of this report be discontinued meantime. This decision is supported on the score of economy, and on the grounds that the details are sufficiently provided in existing statistical reports accessible to all. Further, it must be frankly stated that the value of the North British report is much reduced by the incompleteness of many of the returns sent in.

STATUS OF GAS MANAGERS.

The scale of salaries prepared by the Council in 1919 has been sent to several members on their request; and it is gratifying that the scale has been very helpful to the managers of some small works in improving their position. The Council also gave support and assistance in obtaining a retiring allowance for a gas manager who retired from the service of a corporation after many years' service.

EDUCATION AND TRAINING OF GAS ENGINEERS.

The Council's representative, Mr. James Dickson, of Johnstone, attended in London two meetings of the Sub-Committee of the Institution of Gas Engineers dealing with the Education and Training of Gas Engineers. It is interesting to know that many of the proposals put forward in the scheme prepared by the Council, and submitted at the annual meeting in September, 1919, have been incorporated in the Institution of Gas Engineers' scheme. The Council are of opinion that the scheme will be found beneficial to the profession.

DAVID FULTON, Secretary and Treasurer.

Society of British Gas Industries.—The annual general meeting of the Society, postponed from June, will be held at the Hotel Cecil, London, on Wednesday, Oct. 5, under the presidency of Sir Arthur Duckham, K.C.B. The programme of arrangements for the meeting will be announced later.

CORNISH ASSOCIATION OF GAS MANAGERS.

Summer Meeting.

The Summer Meeting of the Association took place at St. Austell on Wednesday last, by invitation of the President, Mr. HAROLD E. RILEY, Engineer, Manager, and Secretary of the St. Austell Gas Company, Ltd.

Mr. W. M. COODE (the Chairman of the Gas Company) extended on their behalf a hearty welcome to the visitors, who numbered about thirty, including ladies. He trusted all would enjoy the programme which had been arranged.

On the proposition of Mr. H. H. HOARE (Falmouth), seconded by the HON. SECRETARY (Mr. F. G. Kingwell), a vote of thanks was accorded the Company for their kind invitation.

Immediately after the business meeting, lunch was partaken of at the White Hart Hotel. The toast of "The St. Austell Gas Company" was given by Mr. S. A. MARTYN (Wadebridge), supported by Mr. H. H. HOARE; and Mr. S. J. INGRAM (Truro), a Director, responded. "The Ladies" was proposed by Mr. F. J. NETTLE (St. Blazey), supported by Mr. F. R. G. GRANT (St. Ives), to which Mrs. H. E. RILEY responded.

The guests then boarded a char-à-banc, to view the clay mines of English China Clays, Ltd., which Company are the largest producers of china clay in the world, having more than twenty mines. They are also makers of high-class firebricks and tiles at their Lee Moor works. One of their clay mines is nearly a mile in circumference, and 250 ft. deep. Mr. Riley is associated with this Company in the capacity of Consulting Engineer, in connection with the drying kilns, of which they have upwards of forty. The visit proved somewhat of a relief and deviation from perpetual "gas;" many of the members not being familiar with the clay industry. The visitors inspected a 300-H.P. suction-gas engine generating electricity for the clay works. The party were then taken to view Roche Rock, a peculiar physical deformity of the earth's surface, which was thoroughly explained by Mr. Riley, as also was the chapel at its summit. From there they went to Fowey, where tea was taken at the Fowey Hotel.

A hearty vote of thanks was accorded Mr. Riley for arranging such an excellent and interesting programme, which will be recorded in the annals of the Association as one of the best held.

SOME CONDITIONS AFFECTING THE USEFULNESS OF OXIDE OF IRON.

By W. A. DUNKLEY.

(*Concluded from p. 439.*)

CHOICE OF OXIDE.

The choice of material to be used in any particular plant will depend upon a number of conditions. One of the conditions to be considered is the load factor. A plant in which the rate of purification must necessarily be very great during certain portions of the day will evidently need a more rapid oxide than one in which the gas can be passed through the purifiers slowly and at a uniform rate. As has been shown, most of the better oxides will take-up their full capacity of hydrogen sulphide, providing adequate time is given; but where the time of contact is very short, some of them may fail to remove all the hydrogen sulphide from the gas. Another condition to be considered in connection with the activity of a material is the effect of moisture upon its behaviour. The curves of fig. 2 [*see* p. 436] illustrate this condition; and it seems that in practical operation it might well be given greater consideration.

As has been already shown, the activity, and to a lesser degree the capacity, are affected by the moisture content of the oxide. In practice, this is a difficult thing to control. If a material is put into the purifiers to dry, it will not react rapidly; while if too wet, the rapidity of the reaction is also impaired. Moreover, the moisture content of the oxide may change greatly during use. The gas does not always carry a uniform moisture content.

If the temperature of the gas drops on its way through the purifiers, water will be deposited, or, if the gas is unsaturated at the temperature of the purifiers, water will be taken away from the oxide. The sulphiding reaction liberates water from the oxide. The water formed by this reaction, together with water deposited by the gas, may become excessive, and diminish the rapidity of the purifying material. Water has an especially retarding effect upon the rate of revivification; and where revivification *in situ* is practised, an excess of moisture in the oxide may cause slowness in the rate at which the revivification takes place.

It would seem then that oxides the activities of which are least affected by water would be most practical for overloaded plants —especially those in which the overload was caused rather by the high rate of purification necessary, than by excessive sulphur content of the gas. This might be the case in some overloaded water-gas plants. It seems likely that the failure of many of the natural-ore oxides can be attributed, not to any lack of capacity for handling hydrogen sulphide, but rather to the fact that their condition of active operation is limited to a very narrow range of

water content, which is most difficult or impossible to control in practice.

The very active oxides would find great usefulness in catch-boxes, where the function of the material is to remove small amounts of hydrogen sulphide from the gas at the high rates of purification sometimes necessary. For such work, speed in action and in revivification would appear to be the qualities that are most required.

The capacity factor must not by any means be left out of consideration. The experiments made appear to indicate that it is almost necessary to sacrifice capacity in order to obtain high activity, or *vice versa*. The very active oxides usually have a high capacity per unit of iron oxide; but the iron oxide content is usually low. For example, oxide No. 54 contains, when carrying its most favourable water content, only about 21·7 p.ct. of ferric oxide. Since the theoretical decomposition of hydrogen sulphide is 63·9 p.ct. of the ferric oxide content, it is evident that such a material could absorb less than 14 p.ct. of its weight of hydrogen sulphide in one fouling. Therefore, a bushel of sponge, containing (say) 30 lbs. of oxide to the bushel, could purify during one fouling not more than 29,000 c.ft. of gas containing 100 grains of hydrogen sulphide to 100 c.ft. In the case of gas of a higher sulphur content, it may be mentioned, the capacity would be further reduced.

On the other hand, consider one of the slowest materials tested —No. 58 [see table, p. 437]. This oxide absorbed approximately 60 p.ct. of hydrogen sulphide per unit of ferric oxide; and its ferric oxide content was 93·2 p.ct. A bushel of sponge containing 30 lbs. of this oxide would purify approximately 119,000 c.ft. of gas of the same hydrogen sulphide content in a single fouling. Neither oxide No. 54 nor No. 58 was a commercial product; but both appear to represent extreme types of purifying materials. Obviously, the ideal material would be one which combined the properties of both these oxides. The fulfilment of such a condition seems unlikely. The activity of materials typified by oxide No. 54 seems to be due to their large surface; and this condition of large surface appears to be made possible by the inert materials such as calcium sulphate, &c., which prevent the separate particles of oxide from coalescing.

These inert substances, of course, increase the weight and necessitate the use of a greater amount of the material to provide a given amount of active oxide. Oxide No. 58 is almost pure ferric oxide; but, in the absence of any inert constituents to separate the individual particles, the material is denser and slower in action. In oxide No. 60 we have a compromise. The material at its condition of greatest activity and capacity contains about 76 p.ct. of ferric oxide. A bushel of sponge made-up in the same proportions as previously suggested, would purify about 98,000 c.ft. of gas per fouling. Its activity would be greater than that of No. 58, and be less affected by moisture content. On the other hand, moisture would affect it more than oxide No. 54.

Another point to be considered in the choice of oxide is the efficiency which it retains after several foulings. In most cases the more active oxides retain their efficiencies better than the slower materials. As will be seen by the table [p. 437], the capacities of certain oxides over six foulings were determined. No. 54 was not studied to this extent; but the results shown for No. 19 are probably quite similar. The capacity for six foulings is expressed as a percentage of the total amount of hydrogen sulphide which would be decomposed, theoretically, during one fouling by pure ferric oxide. This serves as a standard by which to compare materials of different oxide content.

It will be noted that the performance of oxide No. 19 was 155·7 p.ct. of the standard; while No. 58 was 311·0 p.ct. When it is considered, however, that No. 19 contained only 39·8 p.ct. of ferric oxide on a dry basis, and No. 58 contained 93·2 p.ct. on the same basis, the difference is not so remarkable. It will be noted that the absorption by No. 19 for six foulings was five times as great as for one fouling; whereas the absorption by No. 58 was 3·97 times as great for six foulings as for one. It is evident, therefore, that No. 58 loses its capacity much more rapidly than No. 19. The capacities of these two materials are so different, on account of the disparity in ferric oxide content, that it is likely that they would reach the same capacity only after many more foulings. In the case of some materials whose characteristics are more nearly alike, however, six foulings might be sufficient to determine relative capacities.

Whether six foulings, more or less, would be sufficient in comparing oxides would also depend upon other circumstances. It would obviously be useless to base performance on six foulings if plant conditions were such that the material was practically spoiled with tar after being in the purifiers only three or four times. It would also seem unwise to use a material of exceptionally high ferric oxide content and low activity under conditions where it is almost certain that only a small part of the oxide will come into use. It is to be remembered that a purifier-box is seldom emptied because the contained material is completely fouled. The reason for emptying is almost always that the activity has decreased to such a degree that more hydrogen sulphide is passing forward to the other purifiers than the activity of their contained material will permit them to handle at the rate of gas flow prevailing.

It would appear, therefore, that a material which is able to absorb a large percentage of its theoretical capacity in a short time, or which in other words is very active, granted that its capacity is reasonably large, would be decidedly more efficient in a majority of plants under present conditions than a slower material of much larger capacity.

Summary of Conclusions.

All the experimental work, leading to the conclusions of this bulletin, was performed in the laboratories of the University of Illinois. It would be very desirable if some of the experiments could be checked by operation on a commercial or semi-commercial scale. Taking the laboratory experiments, the conclusions of other investigators, and experience gained in gas-plant operation as a basis, the following conclusions seem justified:

(1) The usefulness of iron oxide for gas purification depends upon its physical, and perhaps upon its molecular, structure, rather than upon its iron content.

(2) There are two factors which determine the value of a particular oxide—namely, (*a*) the rapidity or activity of the oxide for decomposing hydrogen sulphide; and (*b*) the ultimate capacity of the material for decomposing hydrogen sulphide under the operating conditions.

(3) No generally accepted definitions for activity and capacity of oxides have been formulated. Tentative definitions are given in this bulletin.

(4) As defined in this publication, the capacities of some oxides, per each fouling, and, to a greater degree, the activities of the oxides, are affected by their water content.

(5) It is unlikely, as shown by recent researches, that ferric oxide forms any hydrates of definite composition other than the monohydrate ($Fe_2O_3 . H_2O$). It is doubtful whether even this definite compound exists among the synthetic oxides commonly used in gas purification, though many of the synthetic oxides resemble the natural hydrated oxides in physical and chemical properties. Therefore, the water which affects the behaviour of oxides as gas-purifying agents is probably water adsorbed on the surface of the material.

(6) For every oxide there appears to be a best water content at which the material is most active in decomposing hydrogen sulphide. If the water content be increased or decreased from this point, the activity of the oxide decreases.

(7) The best water content varies with different oxides. The lighter, more porous oxides retain a high activity over a greater range of water content than do the denser and more compact materials. The reason seems to be that, above a certain water content peculiar to each oxide, the water excludes the hydrogen sulphide from acting readily with the material.

(8) In general, considering oxides of all types, compared under the same conditions of drying, those materials which retain the most water are the most active.

(9) Of the various materials examined, those of a yellow or yellowish-brown colour are generally more active than the red or reddish-brown oxides. The former are generally more porous in appearance, of lower density, and of higher water content than the latter, and retain their activity over a considerably greater range of water content.

(10) All the yellow or yellowish-brown oxides are transformed into the red or reddish-brown varieties by heating a few hours at 400° C. The activity of the oxide decreases as a result of this transformation, and is restored very slowly, if at all, by re-moistening; nor does the colour return to its former value, at least within several weeks, if ever. The activity lost by heating an oxide a few hours at 200° C. is to a considerable degree regained by re-moistening the oxide and allowing it to stand several days.

(11) Oxides produced by the precipitation of ferric salts from concentrated solutions by alkaline hydroxides or carbonates, and subsequent drying, and rust oxides made with the use of rusting solutions, appear to be comparatively slow in decomposing hydrogen sulphide. Such oxides seem to become still slower in action if subjected to a temperature of 100° C. for several hours. The activity of these materials is generally considerably affected by a comparatively small variation in water content.

(12) Oxides precipitated from ferric or ferrous sulphate solutions by calcium or barium hydroxides or carbonates, and oxides resulting from the slow rusting of iron at a low temperature and in the presence of considerable water, resemble the natural hydrated oxides of iron in colour (yellow or yellowish-brown). Their activities are usually as great as, or greater than, those of natural hydrated oxides, and retain their values over a rather wide range of water content.

(13) The capacities of most oxides are but little affected by water content, though in a few cases excess water slows the reaction with hydrogen sulphide to such an extent that it is completed only after a considerable time.

(14) In general, the more active oxides revivify more quickly, and retain their activity over successive foulings with hydrogen sulphide better, than the slower oxides.

(15) When a hydrated or non-hydrated oxide is sulphided and then revivified in the presence of adequate water, it tends to return to the same appearance, physical state, colour, and water content as it possessed before sulphiding.

(16) Extremes of activity and capacity do not seem to go together. Conditions which increase the surface, and hence

the activity, of oxides, decrease the iron oxide content and hence capacity, and *vice versa*.

(17) The choice of oxide for a particular gas-plant should be governed by conditions prevailing.

This investigation shows that great differences exist between iron oxides available for gas purification, with respect to their usefulness for the purpose. Good materials of each of the types mentioned have been in use since iron oxide was first employed as a purifying agent about 35 years ago. No very radical developments have taken place in the oxide-manufacturing industry during this time. It is unlikely that our best available commercial oxides of to-day are really much superior to the best oxides originally used. Methods of manufacture have probably made possible the production of a more uniform grade of prepared products than formerly. Sources of supply have been developed which, together with the use of machinery in manufacture, have decreased the cost of production, and made good grades of oxide cheaper than they would be had the old methods still remained in use. After 35 years of oxide purification, however, there is no special type of material which is generally recognized as superior to all others. All the types of materials formerly used are still employed.

Improvement in oxides for purification can only come through a thorough understanding of the effects of fundamental conditions upon the character and performance of the product. It has not been possible, in the present discussion, to cover the whole range of possibilities. It has been observed by certain investigators that the presence of alkalis in oxides has an effect on their behaviour out of proportion to the effects directly attributable to the alkalis themselves. This deserves study. It also seems possible that certain catalytic agents might be discovered which would increase the speed of some of the oxides of large capacity.

Oxide purification has its unavoidable limitations. A certain practical ultimate capacity cannot be exceeded, regardless of the quality of the material. Spent oxide is disagreeable to handle, and it is difficult to obtain labour which is willing to handle it. The sulphur in spent oxide, while often in considerable amount, cannot usually be extracted profitably, because of other materials present. Consequently, it is essentially a waste product. The United States import much sulphur annually, though there is a vast amount present in the country could it be made commercially available. All coals of the United States contain sulphur. Indeed, the high sulphur content of most of the Illinois coals is a serious drawback to their use for gas and coke making; and the low-sulphur coals of other regions are steadily decreasing in amount. It appears probable, therefore, that the gas industry must eventually abandon oxide purification for some other process which involves less labour, and less space for equipment, and which produces the sulphur in a form in which it will be available for industrial purposes.

THE BRÖCKER PRODUCER FURNACE.

A paper, read some months ago by Herr H. Trebst, of Wilhelmsburg, before the Society of Gas and Water Engineers of Lower Saxony, describes the system of firing designed by Herr Bröcker for comparatively small benches of horizontal retorts.

Broadly, the system consists in replacing the usual furnace by a chamber which is fed with ordinary coal or even with inferior descriptions of fuel. The chamber functions as a producer furnace, and also as a distillation chamber, according to the depth of the fuel. For the purpose of making clear the twofold nature of the system, the contents of the chamber may be regarded as divided into a series of horizontal layers. At the top is a layer of the fuel in process of distillation—the gas and other volatile products passing off by an ascension pipe, which actually is fitted in the ordinary way to a retort-head. The coke produced in this zone, as distillation proceeds, descends in the furnace and forms the next lower layer. This represents the producer part of the chamber; carbon dioxide generated by the combustion of the coke in the layer below being converted into carbon monoxide, which passes off through a series of midway ports, and undergoes combustion around the retorts placed on each side of the chamber. The third zone from the top, as just mentioned, is that in which the previously heated coke undergoes combustion in the air admitted through passages in the base of the furnace. Below this combustion zone is the collector for ash and clinker, which is provided with means for its periodical removal.

It will thus be seen that the system is advocated as a means of heating small retort-settings and at the same time of adding to the production of gas. According to the size of the setting, the additional make of gas is stated to be from 10 to 50 p.ct.—the percentage increase being, of course, greatest in the case of settings with the smallest number of retorts. It is also claimed for the process that it effects considerable economy of fuel, and that it is readily installed in existing retort-settings. Herr Trebst has had the system in use at Wilhelmsburg since July, 1919, and has been so satisfied with the results that he is gradually converting other furnaces to the Bröcker system, which, it is also stated, has been adopted by a great number of gas-works in Germany, Switzerland, and Sweden.

The Skipton District Council are inviting tenders for the provision and fixing of a water-gas plant. A tender already received for such plant was considered excessive in price.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Field's Analysis.

SIR,—As this is a matter that concerns us all, may I say that to disturb its continuity appears to be unnecessary, since the registered consumption of gas in cubic feet remains our legal basis of charge? A substitution of declared calorific value for the hitherto existing standard of quality seems to be all that is necessary. I hope, moreover, that there is no prospect of Mr. Ibbs abandoning the above well-known title, whatever it may be necessary for him to add as to his highly-valued connection with it.

CHAS. HUNT.

17, *Victoria Street, S.W.*,
Aug. 27, 1921.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Aug. 24.]

Nos. 21,575 to 22,171.

BADISCHE ANILIN-UND-SODA-FABRIK.—"Recovery of valuable products from coal gases." No. 21,874.

BASTIAN, C. O.—"Method of operating thermal storage apparatus heated by gas or oil flames." No. 22,167.

CHEMISCHE FABRIK RHENANIA.—"Process for manufacturing sulphur from sulphuretted hydrogen." No. 21,881.

CLAYTON, H.—"Controlling-valves for liquids and gases." No. 21,678.

EWART, J. W.—"Means for controlling supply of gas for heating water heaters." No. 21,769.

FLOWERS, H. J.—"Heat-distributing cover for gas-stoves, &c." No. 22,171.

FOSTER, A. S.—"Gasification of coal, &c" No. 21,597.

FRÄNKEL, H. A.—"Plant for conveying coke." No. 22,080.

GARRETT, G. S.—"Automatic water-lining attachment for gas-meters, &c." No. 21,940.

GOODY, G.—"Water-vapour supply devices for gas-producers." No. 22,096.

HEARSON, J. W.—"Apparatus for the gasification of coal, &c." No. 22,137.

HELYMAN, F. C.—"Stopcocks." No. 21,656.

HOLMES & Co., LTD., W. C.—See Hearson. No. 22,137.

JOHNSON, J. Y.—See Badische. No. 21874.

MARLOW, T. G.—"Meters for liquids." No. 21,734.

MUNRO, S. H. C.—"Valves for supply-pipes." No. 21,883.

PROJAHN, F.—See Chemische. No. 21,881.

SHEWRING, F.—See Hearson. No. 22,137.

SMITH, J. A.—"Gas heating arrangement for ovens of coal-fire ranges." No. 21,653.

SMITH, E. W., and SMITH METERS, LTD.—"Stuffing-boxes for gas meters." No. 22,166.

STOKES, A. E. FIDDES.—See Ewart. No. 21,769.

WINSTANLEY, H. M.—See Hearson. No. 22,137.

LEGAL INTELLIGENCE.

SMART SENTENCE ON A BOGUS COLLECTOR.

At Greenwich Police Court, last Thursday, before Mr. Fry, Sidney Morton (34), traveller, pleaded guilty to three charges of obtaining money by falsely representing himself to be a collector of the South Metropolitan Gas Company—20s. 9d. from Mrs. Jackson, of Lewisham, £2 16s. 6d. from Mrs. Hutchens, of Brockley, and £6 13s. from Mrs. Collins, also of Brockley.

Mr. PASMORE (who prosecuted for the Company) said he had a list of thirty cases, all of them since the early part of May, in which the prisoner had obtained sums of money from customers of the Company. Mrs. Jackson, when he called, was expecting the collector, and, fully believing prisoner to be authorized, paid him the money and took a receipt. On the same day he called at the house of Mrs. Hutchens, who also paid him. The receipt which the prisoner gave was not, of course, on the Company's form, but on an ordinary printed form taken from a book with counterfoil. This receipt and others he stamped with a rubber stamp bearing the words "Metropolitan Gas Company," and with a word erased which might have been "South." In the case of Mrs. Collins, that lady was not at home; but she had left the amount of the gas account with the maid. When the prisoner called and asked for the gas account, the maid put to him a number of questions, and then paid him. The prisoner had never been in the employ of the Company, and appeared to have gone to these houses "on spec."

Detective LUFF proved two convictions for exactly similar offences. There was a warrant against Morton at Hove for a like offence. To this he pleaded guilty, and asked that it should be taken into account by the Court. Recently the prisoner had visited some houses of a poorer class, with samples of gas mantles, for which he had taken orders and money, but which had not been delivered.

Prisoner said he had been taking orders for gas mantles. If people paid him on account, he took it; but he did not ask for it.

Mr. FRY remarked that there was no doubt the prisoner was a public nuisance and danger. Everybody who owed a gas account was liable to be victimized by him. He must go to prison for twelve months, with hard labour.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATION.

The following notice has appeared in the "London Gazette" of an application to the Board of Trade for an Order under section 1 of the Gas Regulation Act.

Matlock and District Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 5d. per therm.

DECLARATIONS OF CALORIFIC POWER.

Cradley Heath Gas Company.—475 B.Th.U. (Sept. 1.)
Hatfield Gas Company, Ltd.—480 B.Th.U. (Sept. 15.)
Redhill Gas Company.—450 B.Th.U. (Sept. 20.)

GAS REGULATION ACT ORDERS.

Copies have been forwarded by the Director of Gas Administration of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Brigg Urban District Council.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16·4d. per therm within the urban district of Brigg and 18·8d. per therm outside that district.

Prepayment meter clauses are included. (Aug. 25.)

British Gas Light Company, Ltd. (Staffordshire Potteries).

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 13d. per therm.

The words "per therm" shall be substituted for the words "per 1000 c.ft." in section 8 (price of gas supplied to public lamps) of the British Gas Light Company, Ltd. (Staffordshire Potteries), Act, 1866. (Aug. 26.)

Cambridge University and Town Gas Light Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 14·8d. per therm.

As from the declared date, 1·2d. per therm shall be substituted for 6d. per 1000 c.ft. in sub-section (1) of section 6 (extension of limits of supply) of the Cambridge University and Town Gas Order, 1912.

Prepayment meter clauses are included. (Aug. 22.)

Hatfield Gas Company, Ltd.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 18·2d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by five. (Aug. 19.)

Hemel Hempstead District Gas Company.

After the declared date: (1) The standard price in respect of gas supplied by the undertakers shall be 17·2d. per therm. (2) 0·8d. per therm shall be substituted for 4d. per 1000 c.ft. and 1·6d. per therm shall be substituted for 8d. per 1000 c.ft. in sub-section (2) of section 43 (dividend dependent on price charged) of the Hemel Hempstead District Gas Act, 1917.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by five.

After the declared date, the word "therm" shall be substituted for the words 1000 c.ft. wherever they occur in paragraph (8) of section 74 (for protection of the Corporation) of the Hemel Hempstead District Gas Act, 1917.

Prepayment meter clauses are included. (Aug. 22.)

Houghton-le-Spring District Gas Company.

As from the declared date: (1) the maximum price in respect of gas supplied by the undertakers within the township of Houghton-le-Spring shall be 15·4d. per therm; and (2) 1·2d. per therm shall be substituted for 6d. per 1000 c.ft. in sub-section (2) of section 21 (repeal of section 32 of Act of 1879, price of gas) of the Houghton-le-Spring District Gas Act, 1912. (Aug. 19)

Redhill Gas Company.

After the declared date: (1) The standard prices in respect of gas supplied by the undertakers shall be 16·8d. per therm and 18d. per therm; and these prices respectively shall be substituted for the prices of 3s. 6d. and 4s. per 1000 c.ft. mentioned in paragraph (1) of section 20 (as to price of gas, dividends, insurance, and reserve funds) of the Redhill Gas Act, 1900; and (2) the prices of 16d. per therm and 17·2d. per therm respectively shall be substituted for the prices of 3s. 2d. and 3s. 8d. per 1000 c.ft. wherever they occur in the proviso to paragraph (1) of the above-named section.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half. (Aug. 18.)

Salisbury Gas Company.

As from the declared date, the maximum prices in respect of gas supplied by the undertakers shall be 21·2d., 17·6d., and 15·2d. per therm; and these prices respectively shall be substituted for the prices of 6s. 6d., 5s., and 4s. per 1000 c.ft. mentioned in section 52 (limiting the price of gas) of the Salisbury Gas Act, 1864.

After the declared date, the price of 15·2d. per therm shall be substituted for the price of 4s. per 1000 c.ft. mentioned in section 58 (for settlement of disputes between Local Board and Company) of the Salisbury Gas Act, 1864.

Prepayment meter clauses are included. (Aug. 22.)

SPONTANEOUS COMBUSTION OF COAL IN MINES.

Evidence on the Scientific Aspect of the Subject.

Some indication was given in the "JOURNAL" for Aug. 17 of the contents of the final report of the Departmental Committee appointed some years ago to inquire into the circumstances in which spontaneous combustion of coal occurs in mines, its causes, and the means of preventing it, or of dealing with it when it has arisen. Sir R. A. S. Redmayne, K.C.B., acted as Chairman of the Committee, who devoted twenty-six days to the hearing of the evidence of a large number of witnesses. This evidence has been published at different times in three volumes—the first (containing evidence by, among others, Prof. W. A. Bone, Dr. R. V. Wheeler, and Prof. F. P. Bedson) having been dealt with in the "JOURNAL" for April 25 [p. 188] and May 2 [p. 232] of 1916. The second volume had reference to the practical bearing of the investigation from the colliery manager's point of view. This year there has been issued the third volume, much of the evidence in which is with regard to the scientific aspect of the subject; and some notice may be taken of this, in conjunction with the recent publication of the Committee's final report.

The CHAIRMAN, at the opening of the proceedings on the 23rd day of the inquiry, pointed out that Dr. Wheeler had given evidence before the Committee on a previous occasion, and that since then he had been further working on the subject of spontaneous combustion. He was now prepared to put in a report by Dr. Marie Stopes and himself, and had expressed the opinion that the Committee ought also to hear Dr. Stopes, as well as Mr. F. S. Sinnatt.

Dr. R. V. WHEELER, F.I.C., F.G.S.

Proceeding to give further evidence, witness said it was now generally recognized that the main cause of the spontaneous combustion of coal was to be found in the direct action of the oxygen of the air on the actual coal substance, and that the presence of adventitious matter such as pyrites (held in early times to be the sole origin of gob fires) was not even necessary. If the pyrites occurred, it had but slight influence on the rapidity with which a given coal would self-heat. One could get a coal completely free from pyrites which would self-heat, though he agreed that there were certain coals which would not self-heat if it were not for the pyrites present. An inquiry into the manner of spontaneous combustion of coal demanded a knowledge of the nature of the chemical reactions that took place between atmospheric oxygen and the coal substance; and this in turn called for some knowledge of the constitution of coal. Little good was to be gained, for example, by the most exact determinations of the rate of oxidation of some particular sample of coal, unless it was known what portion of the coal substance—a highly complicated conglomerate—was being attacked. A coal seam was far from being of the same character throughout. In the present state of ignorance of the constitution of coal, it was difficult to say which portion it was that oxidized more rapidly than another. Apart from the fact that varied conditions existed in coal mines which affected to a greater or less extent the actual incidence of a fire or dangerous heating in the coal, it was clear that differences in the physical and chemical properties of the coal substance might render it more or less liable to attack by oxygen, and consequently more or less liable to self-heat rapidly. The reactions that took place between oxygen and coal were essentially surface reactions. The nature of the surface greatly affected the course of the reaction of a dense layer of oxygen upon it. This was why the physical nature of one coal might cause a greater speed of oxidation than that of another—because of the difference in the texture of the surface.

The CHAIRMAN remarked that this was important, as it showed the very great bearing that the physical character of the coal had on the rate of oxidation, quite apart from its chemical composition.

Witness said that among practical miners the opinion was prevalent that, when spontaneous combustion occurred in the solid coal, the heating often followed a course which indicated that there was a differentiation of some band or bands in the coal seam which either originated or preferentially transmitted the heating. The existence of dull and bright bands in ordinary bituminous coal had for long been noted. There were, in addition, portions varying in quantity, of a friable nature, commonly known as "mother-of-coal," but better termed "fusain." This was in a compressed dust state, very different from the main block of coal; but it was a point which Dr. Stopes would further elucidate.

Witness, referring to his *précis*, said he would like to know whether it was a generally accepted opinion that a fire in solid coal (he agreed it did not often occur) followed a course which indicated that there was some band in the coal seam which either originated or transmitted the heating.

The CHAIRMAN said he regarded it as an acknowledged fact.

Mr. J. H. W. LAVERICK (a member of the Committee): The only parts of the seam that are popularly regarded by miners as liable to spontaneous combustion are the pyritic parts, where you have the iron pyrites. That, I believe, is common opinion.

Mr. FRANK RIGBY (a member of the Committee): The general run of miners themselves are under the impression that iron pyrites is absolutely necessary; but I think in the early part of our inquiries we abandoned that idea.

Mr. LAVERICK: I have not heard it suggested by miners that any particular bands were more liable than others, beyond the pyrites band.

Witness: I have come across that suggestion fairly often. Continuing, he said the first question which would naturally be asked was whether any of the three zones in coal—the dull, the bright, and the

fusain—was the one which might specially initiate or transmit spontaneous combustion. The bulk of most bituminous coal seams consisted of zones which would probably be classed by those who noted them either as dull or bright; and if heating did in some instances follow distinct tracts in coal, it might well be that either the dull or the bright zone was primarily responsible. If so, it was important to discover what was the differentiating factor. A close examination of any already streaky bituminous coal would reveal the fact that not merely dull and bright, but four distinct zones, could be distinguished. When these four constituents of bituminous coal were studied, it was found that they differed optically as seen by the naked eye, in essential structure as seen in sections under the microscope, and in numerous chemical characteristics. As an essential feature of the study of the spontaneous combustion of coal, consideration of the nature of these four components became necessary. He did not think, until Dr. Stopes undertook the minute examination of these four ingredients of coal, as she termed them, that people realized there was such a vast difference in the chemical and physical properties of different portions of one lump of coal. As the result of researches carried out at the Home Office Experimental Station, the conclusion was reached that regarding the coal *en masse*, the reaction responsible for the self-heating of coal was mainly one of attachment of oxygen to molecules of high carbon content. Subsidiary to this reaction, but playing an important part in determining the actual spontaneous ignition of coal, was a chemical interaction between the oxygen loosely held by the carbon-like molecules, and other atoms in those molecules, or other portions of the coal conglomerate. Preliminary experiments showed, in conformity with the results of other workers: (1) That the absorption of oxygen by newly-won bituminous coal was initially very rapid, even at ordinary atmospheric temperatures, but that this rapid absorption soon gave place to a slow but long-continued absorption. (2) That the initial rapid absorption of oxygen at low temperatures was not accompanied, so far as could be ascertained, by the formation of water or the oxides of carbon; but that during the second—slow—phase of the absorption, these products of oxidation of the coal substance made their appearance, the amounts increasing with the temperature of the coal. So that during the first rapid absorption of oxygen, apparently nothing happened but the absorption.

Mr. Rigby: How long does that period take generally?

Witness: About a minute—not more than that—dependent upon the temperature.

And the slow absorption, how long?—Sometimes many days.

The Chairman: That has a most important bearing from a practical point of view.

Witness, proceeding to give the results of the preliminary experiments, said the next point was: (3) That the ratio of carbon dioxide to carbon monoxide in the products of combustion remained appreciably constant for a given coal at a given temperature throughout the period of long-continued slow absorption of oxygen; the ratio decreasing with increased temperature. What was found with coal showed how close an analogy there was, so far as the obvious effects of the oxygen were concerned, between carbon and coal. Experiments were made with the intention of examining more closely the composition of the occluded gases. All went to show the same kind of results, to all intents and purposes, with coal as with carbon; and as a result, one was justified in giving a similar explanation to that which could be offered for the Oxidation of carbon—namely, that the first step in the oxidation of coal was the formation of an additional compound or complex of oxygen with one or more of the substances present in coal. The fact should be emphasized that the chemical composition of coal was not by any means the only factor to be taken into consideration when attempting to judge whether spontaneous combustion would occur in practice. A knowledge of its chemical composition enabled one to say whether any particular coal should be looked upon with suspicion inasmuch as, other conditions being favourable, it might cause a fire. All coals of high oxygen content should be regarded as suspect. It was what one would suppose, that coals of large oxygen content would have low ignition temperatures. What was known of the constitution of coal pointed to the major portion of the oxygenated compounds normally present being just those of which the structures of the molecules approximated most closely in character to those of carbon, and which might therefore presumably act like carbon in causing a loose attachment of oxygen. A coal rich in oxygenated compounds might therefore be expected to absorb oxygen readily, and thus to self-heat readily. This had been borne out generally in the instances he had tried.

Mr. Laverick put a question as to whether in coking or non-coking qualities of coal would be found the greater liability to spontaneous combustion.

Witness replied that, in general, it could be stated that one would not get a good coking coal with high oxygen content. He regarded anything between 10 and 15 p.ct. as a high oxygen content. Below (say) 6 p.ct., he would regard the coal as non-suspect. As had already been pointed out, it might be taken as an axiom that the more finely divided the coal, and the greater therefore the area of surface exposed to the action of the air, the more rapid would be its oxidation. Determination of the relative friabilities of a number of coals disclosed the interesting fact that coals with low oxygen content had, as a general rule, high friability, and *vice versa*. A tendency towards self-heating due, chemically, to high-oxygen content was thus counteracted by a resistance to grinding and to the formation of fine dust. There were, however, a few coals of which the oxygen content was high and the relative friability medium; and there were some of which the oxygen content was medium and the relative friability high or medium. One would expect such coals, no other factor being taken into account, to be more liable than the majority to self-heat in practice. Of the coals experimented upon, those thus distinguished were all from the North Staffordshire coalfield.

The ingredients of coal represented by its banded structure had been carefully examined and described by Dr. Stopes, who had given them the following distinctive names: Fusain, the equivalent of mother-of-coal, mineral charcoal, &c.; durain, the equivalent of dull hard coal; clarain (banded with bright lustre) and vitrain (conchoidal fracture, brilliant in appearance), together the equivalent of bright or glance coal. These ingredients, which, it must be remembered, were in close juxtaposition in the same block of coal, had been examined chemically at the Home Office Experimental Station, and found to differ markedly in chemical composition and in their behaviour towards reagents. The fusain was the most readily oxidized at a low temperature—15° C. At higher temperatures, like 50° C., the vitrain was the most rapidly oxidized. Though all these ingredients were present in coal, they were not always in the same order. In some parts of a seam, the fusain might form a very large portion of the seam; and this part might be regarded as dangerous, more especially if the fusain was found to be embedded in the vitrain. When the fusain and vitrain were found in juxtaposition, the fusain was most often not in the form of layers in the vitrain, but in pockets. Tests were made on all four ingredients in order to discover whether there was any notable difference in the behaviour of each on oxidation, such as might lead one to expect them to exhibit differences in their liabilities to self-heat. The general conclusions to be drawn from the tests were: (1) Of the three main ingredients of the banded coal, the bright ones—vitrain and clarain—showed greater liability to oxidize and to ignite than the dull durain. (2) The influence of fusain was uncertain. The results of the experiments pointed to its being improbable that fusain had a preponderating influence in determining the actual ignition of the coal after self-heating had begun. But it was conceivable that the rapid absorption of oxygen by fusain at low temperatures might be attended by a sufficient evolution of heat to raise appreciably the temperature of the main mass of the coal, thereby causing the most inflammable ingredient—vitrain—to react more rapidly with oxygen. In other words, the juncture of fusain with vitrain appeared to be critical; and it might be that fusain did indeed act, in the manner attributed to it by practical miners, as "the villain of the piece."

The object of the experiments was to be able to inform the Committee which coals were liable to spontaneous combustion; and then he thought the practical man should know best how to deal with them. It was clear that if they could keep the oxygen away from the coal as far as possible, this was the remedy. He hoped as a result of the work on the composition of coal at the Home Office Station it would be possible to say definitely that, by simple tests, they would be able to judge at once as to the liability to spontaneous combustion of any coal which might be submitted. This was as far as they could go.

HARROW AND STANMORE GAS COMPANY.

The Ordinary Half-Yearly Meeting of the Company was held last Wednesday, at No. 5, Great Winchester Street, E.C.—Mr. A. F. Phillips (the Chairman) presiding.

The Engineer and Secretary (Mr. Charles Chambers) read the notice convening the meeting: and the report of the Directors and the statement of accounts were taken as read.

AN UNRESTRICTED SUPPLY OF GAS.

The Chairman, on rising to move the first resolution, said that the past half year had been a most anxious time for gas companies. There was continually the threat of a strike of the coal miners; and when it did take place, it lasted three months, causing the greatest difficulty in obtaining coal, which had to be imported at most excessive prices, and much of it of extremely inferior quality. Fortunately, the Company were able to obtain satisfactory supplies of oil, allowing of an increase in the production of carburetted water gas. Throughout the whole period of the strike the Company gave an unrestricted supply of gas, which was much appreciated by the consumers. Their customers were, however, requested to restrict the use of the gas to actual necessity; and with this they appeared to have complied. The increase in the quantity of gas sold for the half year was 3·3 p.ct. The price throughout the six months was 5s. 2d. per 1000 c.ft., against 4s. 4d. for the Lady Day quarter, and 4s. 8d. for the Midsummer quarter of the previous year. There had been an expenditure on capital account for the purchase of land, and additions to sulphate plant, mains, services, meters, and stoves of £6225, from which was deducted for depreciation £3605, leaving a net addition to capital of £2620. The receipts for gas were £62,713, against £52,312 in the corresponding previous half year; while residual products realized £16,178 as compared with £13,182. The cost of coal, oil, and coke for producing the gas was £39,164, against £20,984. Wages were £4800, compared with £3495; and repairs £9091, against £7248. Distribution charges amounted to £16,001, compared with £15,116; while rates and taxes were £3205, against £2615, and management cost £2937, against £2456. The resulting sum to be carried to profit and loss was £7705, as compared with £7954. After meeting the charges for debenture interest and income-tax, the balance standing to the credit of profit and loss was £13,448. The proposed dividend would require £6772, leaving £6675 to carry forward.

BACK TO THE PRE-WAR DIVIDEND.

As stated in the report, the Board of Trade made an Order under the Gas Regulation Act fixing the standard price of the gas at 17·2d. per therm, which enabled the Directors to recommend the payment of a dividend at the pre-war rate of 5½ p.ct. on the 5 p.ct. ordinary stock. The proprietors might congratulate themselves on this. The Order was not made without much discussion with the several public authorities in the district, and consideration by the Board of Trade. The dividend, with other charges, was not quite earned; the past half year being £1352 short. But the revenue bore additional charges estimated at £3000, due to the cost of coal imported during the strike; and as under the Order the price of gas is raised by the equivalent of 3d. per 1000 c.ft., unless any unforeseen difficulties had to be contended with, the financial results in the future would be satisfactory. It was, however, necessary to realize that there might be a reduction in the receipts from residuals—especially sulphate of ammonia and tar. The works and plant were in good order, and sufficient to meet all demands likely to be made upon them. He had recently visited the works, and was pleased to find everything most satisfactory. Some additions were being made to the carbonizing plant, which would be completed before

the winter. In conclusion, he moved that the report and accounts be received and adopted.

The Vice-Chairman (Dr. J. W. Lee Glaisher) formally seconded the motion, which was passed without discussion.

The Dividend and Votes of Thanks.

On the proposition of the Chairman, seconded by Mr. A. M. Paddon, dividends for the half year ended June 30 were declared at the rates of 5½ p.ct. per annum on the ordinary stock and 5 p.ct. per annum on the preference stock—both less income-tax.

The Chairman said he had only one more pleasant duty to perform, and that was to propose a hearty vote of thanks to the officers and staff for their services during the past half year. They had had a trying and anxious time; but he was glad to say they had come most successfully through their troubles. The accounts which had just been adopted by the proprietors afforded the best evidence he could give them of this fact.

Mr. Samuel Cutler seconded the proposition, which was cordially agreed to.

Mr. Chambers, returning thanks on behalf of himself and the staff, said it was quite true that they had had a very difficult time; and it was a source of much gratification that they had come through so well. That they had been able to give an unrestricted supply of gas had been a great satisfaction to him. It was no doubt due to the foresight of the Directors. At Harrow they had always maintained a good stock of coal. Of course, this meant capital lying idle; but in times of difficulty such as they had been going through, it was a great advantage.

Mr. E. L. Burton proposed a vote of thanks to the Chairman and Directors; remarking that it had been extremely well earned, as the Board had done uncommonly well for the proprietors. They had emerged with flying colours from a period of unparalleled difficulty. The supply of gas had been maintained without restriction; and coal and oil had been purchased in such well-considered quantities that, when the crisis came, the Company were not found wanting. The dividend was also increased to an appreciable extent. These facts together furnished a record which made the Directors deserving of their very best thanks.

Mr. F. R. Smith, in seconding, associated himself with everything the last speaker had said.

The Chairman, in acknowledgment, said he had had a great many years' experience in the administration of gas-works; and throughout the whole of this period there had never been such an anxious time as the last six months.

HORNSEY GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Company was held on Tuesday of last week, at No. 5, Great Winchester Street, E.C.—Mr. A. M. Paddon (the Chairman) presiding.

The Secretary (Mr. William E. Roberts) read the notice convening the meeting; and the report of the Directors and the statement of accounts were taken as read.

The Chairman said he ventured to think that the proprietors had found the report and accounts more pleasant reading than had been the case for a number of years past. He did not propose to make any long statement on this occasion, because the general character of the report, and the figures in support of it, conveyed to them the improved position of the Company, for which all had worked so hard and long, and in such very difficult circumstances. It was a sincere gratification to the Directors to be able to tell the proprietors that day that they were in a position to pay them the same dividends as were paid before the war; and, over and above this, he thought what they would be anxious to know was that the dividend, as the Board proposed to distribute it, was supported by the figures in the accounts. This he could assure them, generally speaking, was the case. In fact, the result was more than adequately supported by the detail of the account.

Increased Sale of Gas.

From the report it would be seen that there had been a satisfactory increase in the sale of gas amounting to 2 p.ct., which, in all the circumstances, was quite good. A larger increase might have created difficulty in these days, when it was so hard to carry out enlargements and extensions of plant; but the growth of business they had encountered committed them to little or nothing in this way. Looking at the accounts, the first point on which he would reassure the proprietors was as to the relation of the capital of the Company to its business. The capital stood, he thought, at a lower figure than they had hitherto been able to approach. It was under £400 per million c.ft.; and knowing what capital cost to-day—whether to raise, or whether in the amount that it was necessary to expend—it was very gratifying to reflect that their capital outlay was at a figure favourably comparable with any such statistic before the war. Turning to the revenue account, it would be seen that there had been some very big increases in their expenditure Coal, oil, and coke had cost them nearly £20,000 more. On the other side of the account, there was an extremely satisfactory augmentation of the amounts that had been received for gas and for residuals—aggregating to £17,384 increase in the receipts The strange thing about the expenditure was that its growth did not go greatly beyond the figure of £20,000 he had already mentioned in connection with the raw material—the total increase in the expenditure having been £21,025. The net result was that the profit was £3641 less; and this might well be so, when it was realized that in the period under review they had had to deal with the coal supplied during the three months' strike. As they all knew, this coal was furnished, not only at an extortionate rate (which was nothing new, because coal prices were already extortionate), but at the colossal rate of something like £4 or £5 per ton. The point to observe was that they had been able to meet this extra charge for foreign coal, which they had been compelled to purchase in the most disadvantageous circumstances, and yet to show a profit of £6376. This was not quite adequate to meet the distribution that was proposed. It was, however, only about £1000 short; and this was a very small shortcoming when compared with what they had had to spend so as to meet the abnormal and extraordinary state of things through which they had passed. Looking at the accounts critically, one would like to be assured that the Directors had made every proper sort of reservation for repairs and maintenance, in order to keep up the full efficiency of the plant. This he could assure them had been done, as they would see for themselves by glancing at the item "Repairs and maintenance of works and plant," and bearing in mind the modern character of their works. In regard to repairs of mains and meters, again, a very proper allowance had been made before approaching the question of profit. The amount charged for stoves—£660—was very small; but this was the outcome of the very conservative policy of the Board in the past, by which this item of stoves had been written out at a much greater rate than other companies had attempted.

Favourable Position of Consumers.

The really interesting feature of the revenue account was to be found in the part which told them that the results to which he had drawn their attention had been accomplished with a selling price of gas of 4s. 6d. per 1000 c.ft. as a maximum. He did not want to talk too much about comparisons, but it would be found that the price he had named was something like 1s. per 1000 c.ft. less than that charged by their very big neighbour. On the new calorific basis—that was, the charge per therm which they had all found it so easy to understand—the Hornsey price was now the same as that of the South Metropolitan Gas Company, who had always been the pioneers of low-priced gas and efficiency in supply. They would agree with him that it was highly gratifying to be able to show that they could produce these results at practically the minimum selling price in the Metropolis. From the accounts, it would be seen they would carry forward between £15,000 and £16,000, after the distribution which was recommended had been effectuated. The special purposes fund stood at £11,000; and it would perhaps now be a little more than the figure shown. The reserve fund was small; but they could not have a large carry-forward and a big reserve. If they had brought the carry-forward down to a normal figure, they would have had a very large amount to add to the reserve. In connection with the coal, oil, and residual products accounts, there was just this point to be borne in mind—in the period under review, all statistics relating to stocks and working results were far more accurate than in ordinary circumstances, because towards the end of the June half year managers were sweeping out coal-stores and cleaning up coke-heaps in order to keep going. In this way any margin disappeared, and one really did get an almost meticulously accurate statement of working results for this half year in the case of most companies. This was interesting to the proprietors, but more so to the Directors and officials, because they were able to establish fresh data to guide them in the future administration of the undertaking. The only other item to which he would refer was the suspense account as shown in the balance-sheet. They had debited themselves with £9900 as a suspense account, because, as a necessary consequence of the difficult circumstances from which they were just emerging, there was a certain amount still to be done at the works. This was a matter which had been argued over and over again; but the Directors thought it only prudent to make a reservation in this way. As a matter of policy, there could be no argument regarding this course, though as a matter of account there might be a great deal. All this went to show that they were well on the safe side. The Company would be just as stable after the appropriations now proposed as it was before. Therefore it might be assumed with confidence that the undertaking could afford them; and, as far as the Directors could see, it would be able to afford them in the future as well as it had done in the past, to which they now reverted. He concluded by moving the adoption of the report and accounts.

Mr. A. F. Phillips seconded the motion, which was at once unanimously carried.

The Dividend.

The Chairman then moved: "That the sum of £1645 16s., less income-tax, for the payment of the half-year's interest on £65,832 5 p.ct. preference stock to June 30, 1921, be set apart, and that the same be paid accordingly; and that a dividend at the rate of 12½ p.ct. per annum on the 10 p.ct. "A" stock, and at the rate of 9½ p.ct. per annum on the 7 p.ct. consolidated stock, for the half year ended June 30, 1921, subject to income-tax, be, and is hereby, declared payable."

Mr. J. M. Miles seconded the proposition, which was agreed to.

Votes of Thanks.

The Chairman, proposing a vote of thanks to the Engineer and General Manager (Mr. J. W. Buckley), the Secretary, and the other officers and staff, for their services, said that, putting it quite shortly, all the matters of favourable comment to which he had referred in moving the first resolution were in the first place attributable to the efficiency and ability with which affairs were conducted by the executive officers. As to how far these executive officers reflected the directions and policy of the Board, was another matter; but unless they were able to carry out what the Directors required them to do, the thing would never be done. Anyway, the *sine qud non* for success was the competency, energy, and efficiency of the officers; and in their own case the responsibility of the Board was not a heavy one, because their executive officers were such good men. He was sure they would agree that the thanks of the proprietors were due to those who had not only done so well, but done so well comparatively with other gas undertakings, as their officers had done.

Mr. G. W. Carey, in seconding, remarked that the two chief officers were most zealous, assiduous, and excellent men to work with.

The resolution having been cordially passed,

Mr. Buckley, on behalf of himself and his brother officers, said he was sure they were exceedingly grateful for the kind words the Chairman had uttered. They had more than one goal in front of them which they tried to reach. Their first endeavour was to supply cheap gas. They strongly believed that the future prosperity of the gas in-

dustry depended upon the furnishing of cheap gas by the different undertakings; and now that they had the new method of selling on the therm basis—which was acknowledged by experts to afford the fairest comparison between one district and another—he felt they had a difficult task before them to maintain what they had considered their unique position in the past. They would, however, spare no effort to keep down the price per therm. Their next endeavour would always be to maintain the dividend. The two things, in fact, went together.

The proceedings were brought to a close with a hearty vote of thanks to the Chairman and Directors, on the proposition of Mr. E. L. BURTON, who said he supposed there had been no half year like the last one in the history of gas companies. It had been a period of the very greatest anxiety to all concerned. Gas undertakings generally had hardly known where to look for the next hundredweight of raw material; but able management had brought them safely through.

SALISBURY GAS LIGHT AND COKE COMPANY.

The Annual Meeting of the Company was held at the gas-works last Wednesday—Alderman CHARLES HASKINS, J.P. (the Chairman), presiding.

The CHAIRMAN, in moving the adoption of the report and statement of accounts, and the payment of the full statutory dividends, said the past year had been one of grave anxiety. The Directors at the last annual meeting were confidently looking forward to a most successful year's working with the new plant in operation; but the progress of the Company had been retarded, and the cost of working greatly increased, by the long and disastrous coal strike. The Directors and the Engineer and Manager (Mr. William Fielden) decided that, at all costs, the supply should be upheld during the strike. Not only the Directors and the shareholders, but also our customers, should feel much indebted to Mr. Fielden, who would not at any time accept defeat, though there were days when things looked black indeed—with the hopper filled with coal for the next charge of the few retorts in work, but not a scrap of coal otherwise on the works. He had been very pleased to hear from consumers since—some of them in large establishments and institutions where the whole of the cooking was done by gas—an expression of their appreciation of the way in which they had been kept supplied during the thirteen weeks the mines were closed. The reparation coal, costing about £5 per ton, enabled them to carry on; but it was very poor stuff, which produced little gas, of inferior quality, and gave a soft coke—mostly breeze—which made it exceedingly difficult to maintain the retorts at a proper temperature. It was thus a great satisfaction to the Directors that, notwithstanding the difficult condition under which the Company had to work during this period, the accounts still showed profits sufficient to pay the full statutory dividends, and also the bank interest of £1909 due on the temporary overdraft as shown in the profit and loss account. On revenue account the expenditure was £53 929, as compared with £47,326 the previous year; and the income £60,130, against £52,356. In the manufacturing department, coal and oil cost more; but the wages bill, thanks to the new stoking machinery, showed a considerable reduction. They had paid out of revenue £6056 on renewals, and £2000 towards the cost of the new retorts. The balance carried to profit and loss account was £6200; and the reserve fund stood at £6358. The Salisbury Gas Order under section 10 of the Gas Regulation Act had been approved by both Houses of Parliament; and this gave the Company power to raise much-needed additional capital. The Company had never failed to pay the full dividends; and now that things were becoming easier, they would undoubtedly be able to extend the business. With the new carbonizing plant, which was in splendid gas-making condition, the Directors looked forward to the time when they would be able to produce gas at a lower cost to the consumer.

The report and accounts were adopted, and the Chairman, Directors, Manager, and staff were thanked for their services.

COATBRIDGE GAS COMPANY.

The Annual General Meeting of the Company was held on the 16th inst.—Mr. A. S. LEGAT (the Chairman) presiding.

The CHAIRMAN, in moving the adoption of the report and accounts [*ante*, p. 329], said he was sorry to say that, in the long history of the Company, he appeared before them in the unfortunate and unenviable position of being the only Chairman who had ever had to intimate the passing of the dividend. This state of matters had been brought about entirely by circumstances over which the Directors and officials of the Company, and he as Chairman, had absolutely no control—namely, the recent coal strike. When the stoppage began in April last, he did not think anyone anticipated it could possibly last for three months; and they could never have foreseen, as events had proved, that to cover the loss incurred would have required an increased price of 6s. 6d per 1000 c.ft. for the strike quarter, or the equivalent of 9d. per 1000 c.ft. on their output for a whole year. In addition to the coal trouble, there had been since the beginning of the year a great slump in residual products. The Directors had therefore been forced to increase the price of gas by such an amount as would enable them to make up some of the loss and pay a dividend for the current year at about the standard rates. There had been some grumbling at the increased price; but it would be well that consumers should understand the cause of it, and that the Company were only to get a bare return on their capital—not an abnormal one. The installation of vertical retorts was only now in operation—many months after the time indicated by the contractors, and anticipated by the Board. Had it been in operation even six months earlier, the financial position

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to-day would have been very different. There were now, however, better prospects for the current year, in the shape of a very appreciable reduction in labour costs and also in the price of coal. As they approached nearer to normal conditions, he was quite sanguine as to the future of the gas industry. One redeeming feature of the year had been the passing of the Gas Regulation Act, under which they obtained an Order which fixed the standard price at a figure much more in accordance with present conditions than was the previous one. The application was opposed by the Town Council; and this caused considerable unnecessary expense, both to the Company and to them. He said unnecessary advisedly, because he was convinced that, even had there been no opposition, the Board of Trade had been so fair in the consideration of Orders, that the Company would have got precisely the same terms. The unfortunate thing was that ultimately the whole of these expenses would come out of the pockets of the ratepayer and gas consumer.

The report and accounts were adopted; and a vote of thanks was accorded to the Chairman, and to the officials for their services.

At the close of the ordinary meeting, a special meeting was held, when the draft of an application for an Order authorizing the raising of additional capital, and for other purposes, was unanimously agreed to.

Thereafter the new plant was seen in operation by those present.

Brighton Gas Company's Dividend.—For the first half of this year, the Directors of the Brighton and Hove General Gas Company have declared dividends (less income-tax) as follows: On the "original" ordinary stock, 5¾ p.c. (actual); on the "A" ordinary stock, 3¾ p.c. (actual); on the "B" preference stock, 6 p.c. per annum; on the "C" preference stock, 4 p.c. per annum; and on the "D" redeemable preference stock, 7 p.c. per annum. The dividends on the ordinary stocks for the two preceding half years—June 30 and Dec. 31, 1920—were equivalent to 3¾ p.c. on the "original" and 2¾ p.c. on the "A" ordinary stock (actual).

Kendal Gas-Works Results.—The report of Mr. W. R. Wilson (the Engineer and Manager) states that the gross profit of the Kendal Corporation Gas Department for the year to March 31 amounts to £4568, to which has to be added a sum of £434 for interest. After meeting sinking fund and interest charges, the net profit is £516. Out of an accumulated surplus of £2316, the Committee have voted £200 to the renewal account, £212 to meet a deficit on the water-works, and £680 to the relief of the rates. The total quantity of gas made last year was 105,278,500 c.ft.; the amount sent out showing a decrease of 1·45 p.ct. as compared with the preceding twelve months. The vertical retort plant has now been in operation over five years. The yield of gas per ton of coal carbonized (14,651 c.ft.) was less than last year, due to wear and tear, unscreened coal, and better quality of gas. A small unit of plant on the "Sittingbourne" system of total carbonization is being installed.

DUNFERMLINE GAS-WORKS REPORT.

Mr. James Campbell, the Engineer and Manager of the Dunfermline Corporation Gas-Works, has presented to the Gas Committee his report on the working for the year ended May 15 last.

The expenditure on revenue account was £67,965, an increase of £12,875; and the income amounted to £83,100, an increase of £9096 compared with the previous year. The result is a gross profit of £15,135, and a net profit, after placing £500 towards a retort repair fund, of £258, to which has to be added £498 brought from last year, making a total credit balance of £756.

During the year, 19,408 tons of coal were carbonized, the cost of which was £37,286, equal to an average of 38s. 5d. per ton. The price of coal last year was 30s. per ton more than in 1911, an increase of 356 p.ct.; while the price of gas has only increased from 2s. 3d. to 3s. 8d. per 1000 c.ft., an increase of 63 p.ct. During the second miners' strike, considerable quantities of coal, including coal from America, had to be purchased at high prices in order to maintain the gas supply.

The total quantity of gas made during the year amounted to 252,336,000 c.ft., an increase of 3·14 p.ct.; while the amount of coal used showed a decrease of 3358 tons compared with the previous year. The average yield of gas per ton of coal was 13,001 c.ft., compared with 10,742 c.ft.; the increase being due to the installation of vertical retorts, brought into use in August last. The yield of gas during the period of working the vertical retorts was 14,237 c.ft. per ton of coal. Less coals were used last year than in 1917, though the gas made has increased by over 85 million cubic feet.

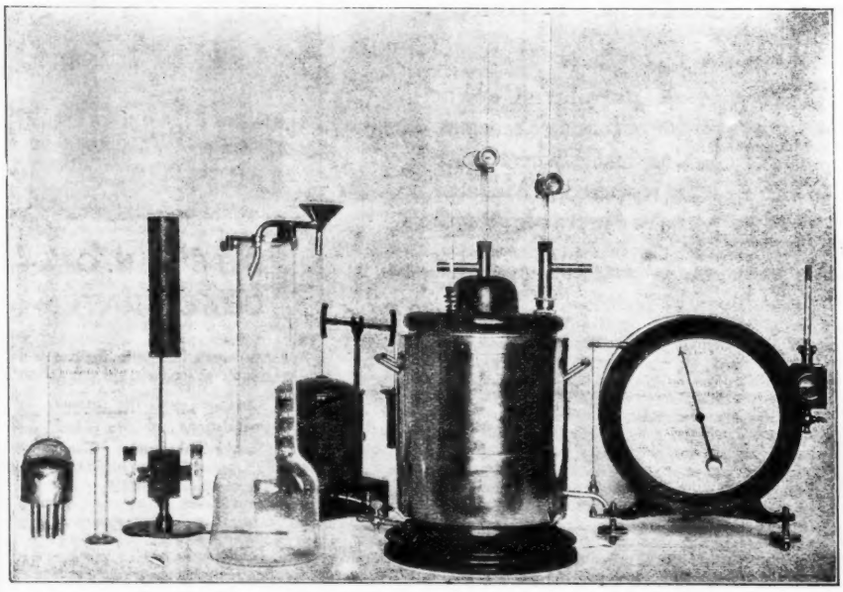
The total wages paid in the works during the year amounted to £14,059, equal to 13·37d. per 1000 c.ft. of gas made. In 1914 the wages were £5588, or 8·4d. per 1000 c.ft.

The net income from residuals was £27,152, compared with £22,229. This return from residuals is equal to 27s. 11·74d. per ton of coal, or 72·82 p.ct. of the cost of the coal, making the net price of coal 10s. 5·35d. per ton.

The new settings of Woodall-Duckham vertical retorts have given the utmost satisfaction; and the results obtained are considerably above the Contractors' guarantee. It is unfortunate that the first year's experience with this new plant should have included times of unparalleled difficulty with regard to coal; and but for this the result would have been better. As it is, with a make of 7,780,000 c.ft. more, there has been a saving of 3358 tons of coal, and a decrease, notwithstanding increases of wages on two occasions, of £2619 in carbonizing wages, compared with the previous year—and this for only nine months' working. It is, says Mr. Campbell, certain that, but for this plant, it would have been a very costly matter to maintain the gas supply to the city during the last coal strike, as the old plant would have required at least 40 p.ct. more coal.

BOYS CALORIMETER.

Gas Referees Latest Pattern.



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An important agreement has just been entered into with the Inverkeithing Gas Company, under which the Corporation give them a supply in bulk, instead of their continuing the manufacture of gas.

The results obtained last year pointed to a reduction in the price of gas; but owing to the losses incurred during the miners' strike, the price had to be increased from 3s. 8d. to 4s. 2d. per 1000 c.ft. as from June 13 last, and unless coal is procured at much lower rates it seems highly probable a further increase must be imposed at no distant date.

FINANCIAL RESULTS AT EVESHAM.

The Gas Committee stated, at the last meeting of the Evesham Town Council, that the report on the audit of the accounts of the department for the year ended March 31 was to the effect that the total expenditure for the year (exclusive of depreciation, interest on loans, and instalments of loans) stood at £27,008, as compared with £20,283 for the previous twelve months. The result of the year's trading, after providing £214 as depreciation, and also for instalment of loan and interest, was £1199 profit, as compared with a loss of £305 for the previous year. The revenue showed increases as follows: Sales of gas, £2969; fittings, £1533; and residuals, £4034. The percentage of sales of residuals on the cost of the coal exhibited the largest increase for years; and it was to this fact that the satisfactory result of the year's trading was to be mainly attributed. The expenditure showed the following increases as compared with the previous year: Coal, £4333; wages, £1396; carriage, £170; repairs of works, £268; tubes and fittings, £386; repairs to stoves, £98; and salaries, £227. The balance due to the Treasurer at the close of the year was £3531.

Alderman FISHER moved the adoption of the report, and mentioned that, at a meeting held on Aug. 3, it was decided to review the financial position of the undertaking as soon as the accounts had been made up for the half year ending Sept. 30 next. This was a matter which would require careful consideration. It was their duty to restore the undertaking, as far as they were able, to the sound financial position in which it was before the war.

The MAYOR asked what they proposed to do in reviewing the financial position of the concern. Was it a question of dealing with the accounts and taking into consideration the actual value of the works, or was it simply discussing how the profits could be increased to wipe out any deficiency? It had always seemed to him that the accounts of the gas undertaking did not show the excellent position they were in. They had the value of the works put down in the accounts at cost price, less many years' depreciation; and the balance they arrived at was a very small one, whereas the works themselves were worth a very large sum.

Alderman FISHER remarked that some years ago they discussed this question; and things were altered to suit the Mayor's ideas. Regarding the review of the financial position, they were selling gas to the consumers at less than it cost to produce; and they wanted to consider whether they could not increase the price. If they could not get coal cheaper, the only alternative would be to raise the price of gas.

The minutes were adopted.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Aug.* 29.

Generally speaking, the position of tar products is quiet in London. There is no doubt a sustained interest in the price of pitch for export. The makers' position, however, appears to be one of ease, in consequence of large deliveries of tar for roads, which demand still continues, and will of necessity lessen the production of pitch. The pitch value is approximately 82s. to 85s. net per ton *ex* maker's works for early shipment. Creosote appears to be distinctly scarce. The price is hardening somewhat. Solvent naphtha 90/160 is about 3s. 1½d. net per gallon. Toluole is about 3s. 6d. net per gallon. Other tar products are unchanged.

Tar Products in the Provinces.

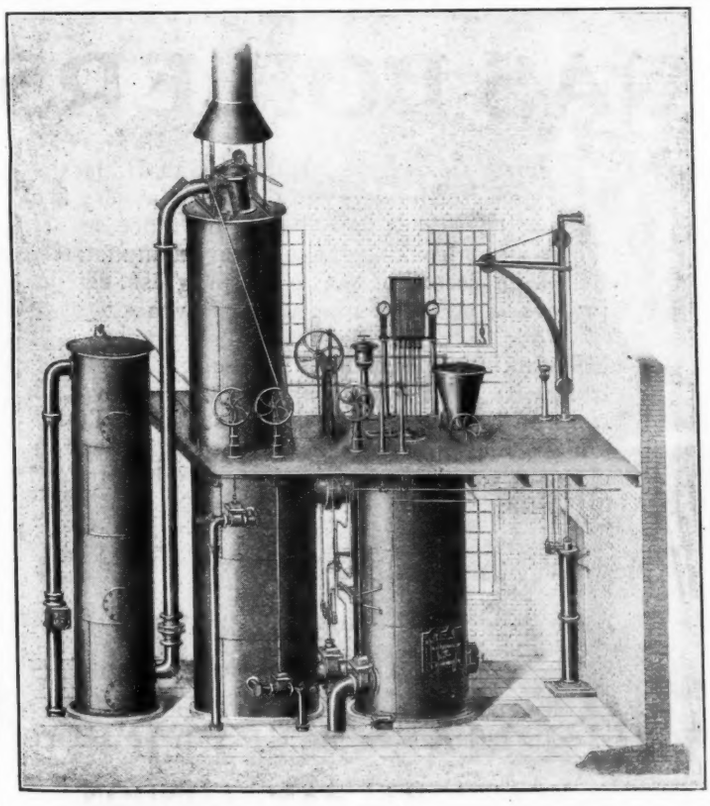
Aug. 29.

The average values for gas-works products during last week were: Gas-works coal tar, 61s. to 65s. Pitch, East Coast, 80s. to 82s. 6d.; West Coast—Manchester, 77s. 6d. to 80s.; Liverpool, 77s. 6d. to 80s.; Clyde, 77s. 6d. to 80s. Benzole 90 p.ct. North, 2s. 4d. to 2s. 6d.; crude 65 p.ct. at 120° C., 1s. 11d. to 2s. naked at makers' works; 50-90 p.ct., naked, North, 2s. 3d. to 2s. 4d. Toluole, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 11d. to 11½d. Solvent naphtha, naked, North, 2s. 8d. to 2s. 9d. Heavy naphtha, North, 2s. 7d. to 2s. 9d. Creosote, in bulk, North, liquid, 9d. to 9¼d.; salty, 8¼d. to 8½d. Heavy oils, in bulk, North, 10½d. to 11½d. Carbolic acid, 60 p.ct., 1s. 6d. Naphthalene, £20 to £30; salts, £7 to £9, bags included. Anthracene, "A" quality, 8d. to 10d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

There has been some improvement in this trade of late with the return to work of many of the coke-ovens. This is a development which is likely to go much further, as the chief customers for coke—namely, 300 large blast-furnaces of the United Kingdom—are gradually getting back to work, or will be doing so within the next few months. No immediate improvement in the production of products is to be looked for; this desirable end should, however, be visible by the



DEMPSTER'S PLANT FOR LIGHTLY CARBURETTED WATER GAS.

DEMPSTER'S
COMBINATION OF
BLUE AND
CARBURETTED
WATER GAS
PLANTS

THE BEST FOR
EFFICIENT
AND ECONOMIC
RESULTS.

R. & J. DEMPSTER, LD.,
GAS PLANT WORKS,
MANCHESTER.

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end of the year, until which time, of course, we must expect low outputs of pitch, naphtha, and benzole. At the same time, it is as well to note that it would be quite impossible to sell a full output. Fairly good business has been done in pitch for export during the past week, although the market is somewhat affected by competition from Germany. The latest values are between 82s. 6d. and 90s. per ton. In addition to the export trade, there is a probability that the South Wales briquette works will soon be buying pitch again. There is much more activity in this area; but many of the works are still taking deliveries under old contracts. The demand for benzole for motor purposes is strong; and as supplies are scarce, prices for immediate delivery are still fairly firm at 2s. 11d. to 3s. 3d., according to proximity to works, &c. There is also a good demand for early deliveries of creosote at 9d. to 9½d. per gallon. There has not been much business in cresylic acid, and the market is irregular, with dark 95 97 p.ct. at 2s. 2d. and pale 97-99 p ct. at 2s. 3d. per gallon. There is nothing fresh in carbolic acid except the export of a further small quantity of crystals to Japan. Crude 60's seem to be almost unsaleable. There is no change in naphthalenes; the demand still being poor. Solvent naphtha is steady at 2s. 10d. per gallon. Intermediate products show some expansion in business, and the outlook is much better than for several weeks past. At the same time, both buyers and sellers are exercising considerable caution in their transactions. One of the most active products in this section is salicylic acid, which, on an improved demand, has advanced to 1s. 6d. per lb. Aniline oil and salts are 1s. 6d. and 1s. 7d. per lb. respectively. Anthracene 40-50 p.ct. is 9d. per unit. Resorcin, technical, is 7s. 6d. per lb.

Sulphate of Ammonia.

There is very little change in this trade. The demand for home agricultural use is somewhat slow, although, with the favourable prices at which this material is now offered, agricultural merchants might find it worth while to take the material into stock in anticipation of an advance which is almost certain to come later on in the season of consumption. Very little is being done for export, on account of competition of other nitrogenous materials produced in other countries.

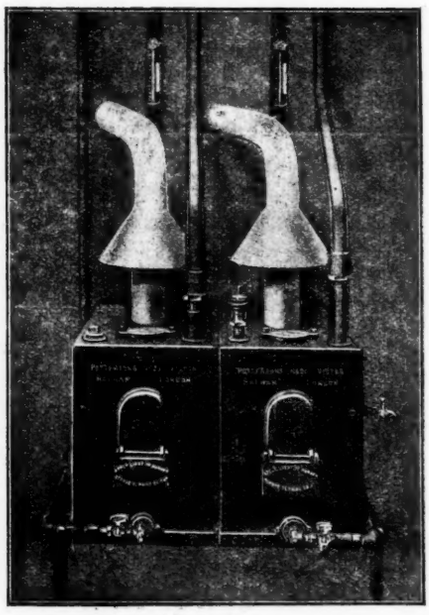
Downpatrick Gas Undertaking.—The Downpatrick Gas Company report a loss on the year's working of £537; and the Directors regret that, for the first time for 39 years, they are unable to declare a dividend. They have decided to increase the price of gas from 10s. to 12s. 6d. per 1000 c.ft. In the earlier part of the year, the Company lost the managerial services of Mr. Chas. Mearns. Another Manager was procured, but was unable to contend with the difficulties in running the plant; and subsequently Mr. Anderson, from the Belfast Gas-Works, was appointed. The Directors hope that, when the deficit is wiped-out and normal conditions are restored, a period of prosperity is in store.

American Coal at Dundee.—The Dundee Gas Committee have notified that coal merchants have refused to take their proportion of the last cargo of American coal—viz., 2000 tons—and that these coals are deposited at the gas-works. An effort is to be made to get the merchants to take the coal. Supplies of Fifeshire coal are being received at the works.

Doubtful Assistance.—The extent to which the intelligence of the average trade unionist goes when asked for help in building-up national industry, was demonstrated at a meeting last week of the Doncaster Trades and Labour Council. A letter was received from the Joint Industrial Council for the gas mantle manufacturing industry, pointing out the serious position of workers in that industry, because, owing to lower wages and longer hours of work in other countries than in England, foreign mantles were imported at a price below the cost of production here. The Industrial Council asked the Trades Council to communicate with co-operative societies and retail traders, urging them to stock British-made mantles, and to insist on a condition being inserted in public contracts that all mantles should be British made. The Council expressed the view that it "did not matter a toss where the mantles came from, if they were made under trade union conditions;" and they passed a resolution asking the Doncaster Town Council and the local co-operative society to support firms paying trade union rates of wages.

Useful Water-Gas Plant at Wellingborough.—In their report for the past six months, the Directors of the Wellingborough Gas Light Company, Ltd., state that in previous accounts depreciation has not been charged; but the Directors have now decided to write-off from the capital account the amount which the Inland Revenue authorities have allowed in computing the Company's liability for income-tax. The allowance in respect of the year 1919, which amounts to £2598, has therefore been deducted from the net balance brought forward from last half year, leaving a balance of £2124. The allowance for 1920, amounting to £2505, has been included in the charges to revenue account. The balance available for dividends, after payment of income-tax for the year and interest for the half year, is £1786; and the Directors recommend that out of this sum dividends of 4 p.ct. on the "original" and 2½ p ct. on the "additional" shares, less income-tax, be declared for the half year. This will absorb £1157, leaving £629 to be carried forward. The Board of Trade has granted the Company's application for an Order under section 1 of the Gas Regulation Act. In January of last year the Directors decided to erect a carburetted water-gas plant, which was completed and brought into operation just before the coal strike. By the use of this plant, great economies were effected in the consumption of coal, of which a large stock had fortunately been accumulated. The Company were thus able to maintain an absolutely unrestricted supply of gas throughout the whole period of the strike, without resorting to the purchase of expensive foreign coal. The expenditure on capital account considerably exceeds the authorized capital of the Company; and the Directors propose to apply for a Special Order to authorize the raising of fresh capital.

VICTOR GAS BOILERS



A first-rate example of Boiler Plant in connection with Hot Water Heating Apparatus, reproduced from actual practice.

The reputation of "VICTOR" Gas Boilers as efficient water heaters stands upon a very firm foundation, and is daily becoming more secure. Their reliability and durability are demonstrated by a long record of successful progress, extending over a period of nearly twenty years.

Substantially constructed throughout of cast-iron, with adequate access for the removal, *in situ*, of lime and flue deposits, "VICTOR" boilers receiving regular attention by way of cleaning can be maintained at a high standard of efficiency.

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Colchester Gas Company.

Moving the adoption of the balance-sheet at the half-yearly meeting of the Company, the Chairman (Mr. W. G. Benham) said that fortunately they started the six months with large stocks of coal and oil. Shortly before, stocks had been very low; but the approaching storm was seen, and the Company piled-up all the stock of coal they could get, screened or unscreened. These stocks, with careful management and the use of the water-gas plant, enabled them to maintain a full gas supply at normal pressure throughout the coal stoppage. Towards the end of the trouble some foreign coal—three small cargoes—had to be purchased. It was very costly, and of poor quality, and involved considerable expense to the Company, who would have suffered very seriously but for the stocks of coal referred to. An Order had been obtained putting the sale of gas on the therm basis. At the same time it granted some tardy relief to the shareholders. The Company now enjoyed friendly relations with the Town Council; and though the Council felt it their duty to make formal objections, a conference soon settled matters amicably. The new standard price fixed enabled the Directors on this occasion—for the first time for several years—to recommend the full dividends of 10 p.ct. on the "A" shares and 7 p.ct. on the "B" shares. He referred to the completion of the Company's new plant, with very satisfactory results as regards efficiency and economy of production, and paid a tribute to the valuable work of the Engineer (Mr. W. W. Townsend), and to the zealous services of the Secretary (Mr. W. English), and the staff generally. Subsequently an extraordinary general meeting was held at which authority was given for the raising of new capital by the creation and issue of 300 new shares of £20 each.

Importation of Chemicals.—The Board of Trade have informed the Chemical and Dyestuff Traders' Association that Part I of the Safeguarding of Industries Act (which deals with all synthetic organic chemicals) will come into full operation on Oct. 1, and that all goods included in the schedule to the Act arriving in this country on or after that date will be liable to the duty, without regard to the date on which they may have been ordered.

Theft from a Gas-Meter.—At the Nantwich Police Court, Thomas Dowling was charged with stealing 18s. 3d., the property of the Urban District Council, from a gas-meter at his house. He was also charged with doing wilful damage to the meter to the extent of 9s. 3d. Prosecuting, Mr. A. E Whittingham (the Clerk to the Council) laid stress on the fact that money placed in a gas-meter became the property of the Council; and it was as much an offence against the law to steal the money as if it were taken from a shopkeeper's till. Prisoner said he had been out of work for four months, and admitted that he acted foolishly, not realizing how serious it was until after he had done it. He was fined £1, or fourteen days' imprisonment, on the first charge, and 2s. 6d. and costs, on the second charge; the Chairman remarking that, the man being an ex-soldier, they had looked upon the case favourably, as it was his first offence.

Winchester Water and Gas Company.

It was reported by the Directors at the recent half-yearly meeting of the Company that an application was made to the Board of Trade for an Order under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, to empower the Company, pending the receipt of an Order, for which application had been made under the Gas Regulation Act, to increase the price of gas; and an Order was made on May 3 authorizing the maximum charge of 6s. 6d. per 1000 c.ft. from that date—at the same time restricting during the continuance of the Order the dividend on the consolidated ordinary stock to a rate of not more than 3½ p.ct. per annum. The Directors therefore recommended the payment for the half year of a dividend on the preference stock at the rate of 4 p.ct. per annum, and on the consolidated ordinary stock at the rate of 3½ p.ct. per annum (less income-tax). The balance of net profit of £1450 was not sufficient to provide for these dividends; and it would be necessary to withdraw from the reserve fund account. The Winchester Water and Gas Company's (Capital Issues) Consent, 1921, was given by the Board of Trade on April 4; and in accordance with the powers thereby obtained, the Directors offered to the shareholders, gas consumers, and the public £25,000 of 7½ p.ct. debenture stock redeemable at par on July 1, 1931, or at the option of the Company on or after July 1, 1926, on giving six months' notice. This issue was over-subscribed. The Directors were able to report that, notwithstanding the difficulties caused by the recent coal strike and the continuing drought, the gas and water supplies had been maintained without curtailment.

Southgate and District Gas Company.—In accordance with powers secured under the Gas Regulation Act, the Directors have declared the following dividends (less income-tax) for the half year ended June 30: On the "original" ordinary stock, 7½ p.ct. per annum; on the "additional" ordinary stock, 5½ p.ct. per annum; and on the preference stock, 5 p.ct. per annum.

Camborne Gas Company, Ltd.—Dealing with the accounts for the year ended June 30, the Directors say they have again the satisfaction to report a considerable increase in the quantity of gas sold during the year. This, with various economies effected in manufacture, has resulted in a slightly increased profit on the year's working. The recent strike of coal miners was a source of great anxiety to the Board; but the supply of gas was maintained without interruption during the whole time, and with but little inconvenience to the consumers. During the later period, however, imported coal was purchased at outrageously high prices, which necessitated a temporary increase of 1s. per 1000 c.ft. in the price of gas. The balance standing to the credit of the profit and loss account is £1732. In consequence of the necessity for increased working capital, the Directors consider it desirable not to recommend the distribution of a higher dividend than 5 p.ct. per annum, less income-tax. This will leave a sum of £1067 to be carried to the next account.

ECONOMY OF COAL

This Testimonial

FROM A GAS ENGINEER

Should Convince You

DEAR SIRS, 1st *April*, 1921.

It may interest you to know the result of your suggestion that we should coat the front of our retort benches with "Everok" for the preservation of the brickwork and at the same time the conservation of heat.

I might first mention that we were unable to carry out your suggestion to apply the "Everok" by means of a spraying machine as such was not available and consequently had no alternative but to apply the "Everok" with an ordinary hand brush.

Even with this superficial application I am pleased to inform you that the brickwork shows absolutely no deterioration whatever after nine months' continuous use, although in the ordinary course of events (due to our unfortunate method of working) we should have anticipated signs of deterioration within two months. The preservation of the brickwork is so remarkable that I estimate we have already saved the cost of material and labour many times over apart from the question of economy in fuel. Even the workmen remark how nice and cool it is in front of the bench treated with "Everok."

Whilst I shall be delighted to allow any Engineer to inspect the Retort Bench in question and obtain any information he may require, I think the cost of labour and materials necessary to coat an ordinary retort bench so small compared with the remarkable results obtained that I have no hesitation in recommending every Gas Engineer to make the experiment for himself.

Yours faithfully,
Name on application.

EVEROK
THE WATERPROOFER

Is a colourless solution on the "NO-VOID" principle for rendering the surface of EXISTING CEMENT, CONCRETE, STUCCO, BRICK, STONE, &c., impervious to water or the destructive action of nature.

Manufactured by

THE TORBAY & DART PAINT CO., Ltd., 26, 27 & 28, Billiter St., LONDON, E.C.

Wolverhampton Gas Company.—The accounts of the Company for the half year ended June 30 show a loss of £3827, after providing for debenture interest. It is proposed to transfer £6281 from the dividend equalization fund, and to pay dividends of 5 p.ct. on the consolidated stock and 3 p.ct. on the new ordinary stock.

Barnsley Gas Company.—Mr. E. G. Lancaster, presiding at the annual meeting of the Company, said that during the recent miners' strike they had to cease making gas for a period, a thing that had never before occurred during the hundred years' history of the Company. Their expenditure had been £69,211—an increase of £10,300 over the previous year. The increase in coal was £2588, wages £2612, and repairs £4000. They received £528 more for gas, £2467 more for coke, and £3050 more for tar. For the first time for 28 years they had had recourse to the reserve fund; and, by taking £2283, they were able to pay the maximum dividend. The report was adopted.

Hawick Gas Company.—The Hawick Gas Light Company have raised the price of gas to 5s. 10d. per 1000 c.ft. The Directors state that, owing to increased costs, after providing for the debenture redemption instalment there was a loss for the past year of £3052.

Ardsley Gas Supply.—After a little extra indignation meeting within the ordinary Council meeting, the Ardsley East and West Urban District Council last week decided to send a deputation to the East Ardsley Gas Company, to see what might be done to improve the gas supply. In the course of the meeting there were vigorous complaints against the quality of the gas; but subsequently the tone of the attack was much modified. One member admitted that, when he made personal complaint to the Gas Company, they sent a man to his place, and the light had since been all right. Several other members hastened to say that they did not blame the Company entirely; there might be other faults. They did not, of course, go the length of admitting that their household pipes might be at fault.

STOCK MARKET REPORT.

THERE was a little more animation in things on the Stock Exchange, considering that the tide in affairs is just now at about dead low water of the vacation; and the tone on the whole was slightly more cheerful in many markets, though some were still quite unable to improve.

In the gilt-edged market, Home Government issues were not among the fortunate gainers. Prices for the big four on Friday were as follows: Consols 47⅝-48⅛, War Loan 88⅛ 88⅝/₁₆, Funding 70⅞-71⅛, Victory 76½-76⅞; War Loan being the only advance. Bonds were irregular. Indian were depressed by the trouble in the south. Home Rails were in demand and advanced, though checked in midweek by some profit-snatching. Canadian and Argentine were easy.

The Foreign Market fell away after some hesitation; but Brazilian, Chinese, Japanese, and Mexican recovered slightly. The Miscellaneous Market showed weakness. Rubber had another thoroughly dull week. Oil fluctuated from time to time, but closed not much the worse. Most of the Industrials failed to attract; Textiles, Iron and Steel, and Shipping being most in evidence.

Business in the Gas Market was scarcely up to the level of the preceding week in point of activity; but it was rather more evenly distributed throughout the list, and not so restricted to one or two of the biggest undertakings. The tone generally was quite favourable. A large number of quotations were varied. Most of them were *ex div.* adjustments; and the majority were to the advantage of holders. The Suburban and Provincial companies were especially noticeable in this respect.

Bargains done for cash during the week were as follows: On Monday, Cape Town preference 4¼, ditto debenture 55, Continental Union preference 32⅜, Gas Light ordinary 55⅜, 56, 56¼, ditto debenture 51¼, Imperial Continental 125, South Metropolitan 66, 66¼, Tottenham "B" 53, South Metropolitan 6½ p.ct. debenture, £17 paid, 19¾-19⅞, ditto, fully paid, 99⅛-99⅜. On Tuesday, Alliance and Dublin 46, 47, Bombay 3, 3¼, British 23½, European 7⅛, 7 7/16, Gas Light ordinary 55⅛, 56¼, ditto maximum 43, Imperial Continental 125 (and exceptional 112½), San Paulo preference 6, South Metropolitan 65⅜, 66, 66¼, South Suburban debenture 74, South Metropolitan 6½ p.ct. debenture, £17 paid, 19⅜-19⅝, ditto fully paid 99¼-99⅜. On Wednesday, Bombay 3, Brentford "A" 69, Gas Light ordinary 55⅜, 56¼, 56½, ditto preference 59, 59⅜, ditto debenture 51⅛, Imperial Continental, 125, 126⅛, ditto debenture 80, Oriental 92, Primitiva 11s., ditto preference 29s., Wimbledon 54½, South Metropolitan 65⅛, 66¼, 66⅜, ditto 6½ p.ct. debenture, £17 paid, 19⅜-19⅝, ditto fully paid 99½. On Thursday, European 7¼, Gas Light ordinary 55⅜, 56, 56¼, ditto debenture 51⅛, 51⅞, Imperial Continental 126¼ (and exceptional 100), Newcastle 57⅜, 57⅝, 58, Primitiva 11s., 12s., South Metropolitan 65¼, 66, ditto 6½ p.ct. debenture, £17 paid, 19½, ditto fully paid 99⅛-99⅜. On Friday, European 7¼, Gas Light ordinary 55⅜, 56, 56¼, ditto debenture 51⅛, 51⅞, Imperial Continental 127, Primitiva 11s. 3d., 12s 6d., South Metropolitan 66¼, ditto 6½ p.ct. debenture, £17 paid, 19⅜-19⅞, ditto fully-paid 99⅜-99⅝.

In the Money Market, the situation at the opening was quite easy; but an improved demand for accommodation soon made itself felt. This, however, gave way to some extent before the close. Discount terms generally marched in step with the above. Silver varied a little above or below 38d., which was the closing figure. The Bank rate is 5½ p.ct., as fixed on July 21.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.c. Pref.	...	50—55*	...
1,551,868	,,	Apl. 14	2½	3⅛%	Alliance & Dublin Ord.	59—64	43—46	46—47
374,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	46—51	...
280,000	5	Aug. 11	7½	4/-	Bombay, Ltd.	5½—6½	3—3⅛	3—3⅛
100,000	5	,,	16	4/7½	Bournemouth Gas and Water: 5 p.c.	...	7½—8½	...
383,110	10	,,	7	7/-	Bournemouth Gas and Water: B 7 p.c.	15—15½	8½—9⅛	...
115,000	10	,,	6	6/-	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	7½—8½	...
162,065	—	June 30	—	4%	Bournemouth Gas and Water: 4 p.c. Deb.	...	54—59	
992,045	Stk.	July 15	14	56/-	Brentford A Consolid.	261—266	65—70	69
734,920	,,	,,	11	55/-	Do. B New	204—209	60—65	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	67—71	...
221,400	,,	June 15	4	4%	Do. 4 p.c. Deb.	91—93	56—58	...
214,775	,,	Aug. 26	11	10½%	Brighton & Hove Orig.	208—213	110—115*	...
244,200	,,	,,	8	7½%	Do. A Ord. Stk.	154—159	77—82*	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Mar. 30	12½	10%	British	44—45	22—24	23⅛
120,000	Stk	June 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	53—56	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	38—41	...
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd.	1½—2½	6¼—7½	...
100,000	10	Apl. 28	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5½	4½
100,000	Stk.	June 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	53—58	55
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	July 28	5/9/14	42/8	Commercial 4 p.c. Stk.	106—108	53—58	...
560,000	,,	,,	5½	38/4	Do. 3½ p.c. do.	103—105	50—55	...
475,000	,,	June 15	3	3%	Do. 5 p.c. Deb. Stk.	69½—71½	42—45	...
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	17—22	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	30—40	32½
51,600	,,	Aug. 26	15	15%	Croydon A 10 p.c.	...	125—135*	...
278,400	—	,,	12	12%	Croydon B and C 7 p.c.	...	95—105*	...
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	7—8	7⅜—7 7/16
16,298,975	Stk.	Aug. 11	1/17/4	46/8	Gas Light and Coke: 4 p.c. Ord.	98—102	55—57	55⅛—56⅛
2,600,000	,,	,,	3½	35/-	Gas Light and Coke: 5½ p.c. max.	76—79	43—46	43
4,062,235	,,	,,	4	4%	Gas Light and Coke: 4 p.c. Con. Pref.	96—99	57—60	59—59½
4,674,850	,,	June 15	3	3%	Gas Light and Coke: 5 p.c. Con. Deb.	72½—74½	50—52	51½—53⅛
130,000	,,	Dec. 11	10	10%	Gas Light and Coke: 10 p.c. Bonds.	...	...	...
82,500	,,	Mar. 11	5	3⅛%	Hastings & St. L. 5 p.c.	...	48—53	...
258,740	,,	,,	3½	2⅛%	Do. 3½ p.c.	87—89	34—39	...
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16½—16¾	5—6	...
86,600	Stk.	Aug. 26	9	9⅛%	Hornsey 7 p.c.	...	75—85*	...
131,000	,,	July 28	7½	7½%	Ilford A and C	151—154	76—81	...
65,780	,,	,,	6½	5⅜%	Do. B	115—118	55—60	...
65,500	,,	June 30	4	4%	Do. 4 p.c. Deb.	92—94	53—55	...
1,976,000	,,	May 27	9	5%	Imperial Continental	150—160	125—130	125—127
1,235,000	,,	Aug. 11	3½	3⅛%	Do. 3½ p.c. Deb. Red.	84—86	77—82	80
235,242	,,	Mar 30	6½	3⅛%	Lea Bridge Ord. 5 p.c.	119—121	65—70*	...
2,498,905	,,	Feb. 26	10	37/-	Liverpool 5 p.c. Ord. A.	211—213	...	...
					Liverpool 5 p.c. Ord. B.	146—148	...	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Aug. 11	7/5/-	6%	Maidstone 5 p.c.	...	52—57	...
63,480	,,	Dec. 30	—	3%	Do. 3 p.c. Deb.	...	40— 43	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4½—4¾	1⅞—2⅛	...
250,000	100	Apl. 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	88—93	...
541,920	Stk.	May 27	4	6%	Monte Video, Ltd.	11½—12	55—60	...
1,875,892	,,	July 28	4½	3%	Newcastle & Gatsh'dCon.	98½—99½	57⅜—58⅜	57⅜—58
529,705	,,	June 30	3½	3⅛%	Do. 3½ p.c. Deb.	82—83	48¼—50¼	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	...	12⅜—13⅛*	...
35,940	10	,,	7/14/-	5/3	,, ,, 7 p.c.	14—15	7⅛—8*	...
300,000	Stk	May 12	8	8%	Oriental, Ltd.	117—122	88—93	92
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅞	2—3	...
188,120	Stk.	June 30	—	3⅛%	Plym'th & Stoneh'se 5 p.c.	...	63—68	...
60,000	50	Aug. 26	13	60/-	Portsea Island, B	128—131	63—68*	...
100,000	50	,,	12	55/-	Do. C	118—121	50—55*	...
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	3—3⅛	11/—12/6
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4½—5	1 1/16—1 3/16	29/-
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	65—67	...
600,000	Stk	July 28	4	4%	Do. ,, ,, 1911	...	38—41	...
346,198	,,	June 30	4	4%	River Plate 4 p.c. Deb.	85—87	38—41	...
150,000	10	Mar. 30	6	6/-	San Paulo 6 p.c. Pref.	10½—11	5⅛—6⅛	6
125,000	50	June 30	5	5%	San Paulo 5 p.c. Deb.	47—49	34—39	...
135,000	Stk.	Aug. 26	10	5%	Sheffield A	223—224	60—65*	...
209,984	,,	,,	10	4%	Do. B	222—224	60—65*	...
523,500	,,	,,	10	4½%	Do. C	220—222	55—60*	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	June 30	9	8%	South African	10½—11½	7—9	...
6,609,895	Stk.	July 28	5/4/-	5%	South Met. Ord.	111—113	65—67	65⅛—66⅛
250,000	,,	July 14	—	5%	Do. Red. Pref.	...	92—94	...
1,895,445	,,	,,	3	3%	Do. 5 p.c. Deb.	72½—74½	46—49	...
224,820	,,	Feb. 25	8½	7½%	South Shields Con. Stk.	157—159	85—87	...
1,087,795	,,	Aug. 11	6	5⅜%	S'th Suburb'n Ord. 5 p.c.	114—116	62—67	...
368,837	,,	June 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	72—77	74
647,740	,,	May 12	7½	3⅛%	Southampton Ord.	99—102	55—58	...
121,275	,,	June 30	4	4%	Do. 4 p.c. Deb. Stk.	...	56—58	...
120,000	,,	Aug. 11	—	6%	Tottenham District: A 5 p.c.	135—138	60—65	...
782,275	,,	,,	6	4⅛%	Tottenham District: B 3½ p.c.	115—117	52—57	53
181,255	,,	June 15	4	4%	Tottenham District: 4 p.c. Deb.	87—89	52—55	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Feb. 25	5	3⅛%	Tynemouth 5 p.c. max.	108½—109	68—70	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Aug. 11	8½	66/3	Wandsworth A 5 p.c.	151—156	77—82	...
255,636	,,	,,	6½	51/3	Do. B 3½ p.c.	129—134	54—59	...
108,075	,,	,,	—	46/4½	Do. C	...	54—59	...
140,865	,,	,,	—	46/4½	New Ordinary	...	54—59	...
552,000	,,	,,	6½	45/-	Wimbledon 5 p.c.	117—122	52—57	54½
98,000	,,	,,	6½	50/-	Epsom 5 p.c.	121—126	54—59	...
88,476	—	June 30	4	3%	4 p.c. Deb. Stk.	66—69	40—45	...

* Ex Div.

Importation of Gas-Stoves into New Zealand.—A notice appeared in the "Board of Trade Journal" last May, stating that the importation of gas-stoves into New Zealand was prohibited, except under licence. An Order in Council, dated June 12, has now been issued revoking this prohibition, and allowing freely the importation of gas-cookers into the Dominion.

Public Lighting Charge at Stornoway.—At a Town Council meeting, the Clerk was instructed to write the Stornoway Gas Company to ask for a reduction in the price of gas, in view of the fact that the Council are large consumers. Mr. Macleod said it was scandalous that they should be paying 13s. 4d. per 1000 c.ft., which was out of proportion to the cost of gas for street lighting in any other part of the country. The only extra charge that should be made at Stornoway was for freight of coals by sea.

Co-Partnership at Croydon.—The accounts for the year ended March 31 presented by the Co-Partnership Committee of the Croydon Gas Company, show that the bonus has been calculated at the rate of 4 p.ct. Up to the date named, from the inception of the scheme in 1912, 1252 co-partnership agreements have been entered into, and 533 have terminated, leaving 719 agreements in force. The bonus for the twelve months under review amounts to £3230, and the savings to £2578. The savings (for 12¼ years) amount to 76 p.ct. of the total credited as bonus.

North Middlesex Gas Company.—An Order issued by the Board of Trade under the Gas Regulation Act, 1920, authorizes the Company to hold an annual general meeting instead of half-yearly general meetings, and empowers the Directors to pay interim half-yearly dividends. In accordance with these powers, the Directors have declared the following dividends for the six months ended June 30: On the "original" ordinary shares, 7½ p.ct. per annum; on the "additional" ordinary shares, 5¼ p.ct. per annum; and on the preference stock, 5 p.ct. per annum.

Free Services for Housing at Sandbach.—At a meeting of the Urban District Council of Sandbach last week, the Housing Committee reported that the Gas Company were prepared to lay a service of gas-pipes to the new houses free of charge. Mr. G. Newall, the Chairman of the Housing Committee, called the attention of the Council to the Company's generosity in exceeding what was legally required of them. Some 420 yards of ¾-in. piping would be needed in excess of what the Company ought to provide. The Company's generosity should be recognized by the Council.

Bridport Gas Company, Ltd.—Presenting the accounts for the year ended June 30, the Directors said they were pleased to submit so satisfactory a report, considering the abnormal conditions through which the gas industry has recently passed. The erection of the blue water-gas plant was fortunately completed before the commencement of the miners' strike, enabling the Company to maintain a much better supply of gas than would otherwise have been possible. Other extensions of the plant have been carried out during the year, including a new boiler and boiler house and steam-engine; while 2 acres of land adjoining the gas-works have been purchased with a view to probable future extensions. In accordance with powers sanctioned by the shareholders last year, the capital of the Company has been increased and re-arranged by the addition of 3600 £1 "B" cumulative preference shares, and 3600 £1 ordinary shares, and the conversion of the 900 £10 ordinary shares into 9000 £1 ordinary shares. The Directors recommended the payment of dividends at the rate of 5 p.ct. on the "A" preference shares, 6½ p.ct. on the "B" cumulative preference shares, and 10 p.ct. on the ordinary shares, less tax.

The Pneumatic Gas Lighting Company, Ltd., intimate that they are reducing the advance on their goods from 150 p.ct. to 100 p.ct., as from Sept. 1.

The Ideal Homes Exhibition opens on Sept. 19, at the Kelvin Halls, Glasgow. Gas demonstrations will be given; and an official visit is to be paid by members of the British Commercial Gas Association.

The Clitheroe Gas Committee have passed a resolution extending their best thanks to the Chairman and Manager (Mr. R. Barrett) "for their excellent work during the coal strike, and their efforts in keeping the town supplied with gas."

At Easingwold (Yorks.) the wave of economy in public administration has gone the length of a decision of a ratepayers' meeting not to have the streets lighted at all, though the Easingwold Gas Light and Coke Company made a reasonable offer.

We learn from the Hon. Secretary (Mr. James C. Scott) that the Golf Competition in connection with the North British Association of Gas Managers' meeting is being revived, and will be held on the date preceding the forthcoming meeting—Wednesday, Sept. 7—over the Craigie Golf Course, Perth, at 3.30.

The Directors of the Aldershot Gas, Water, and District Lighting Company have declared an interim dividend, for the half year ended June 30 last, at the full statutory rates according to their standard (authorized by the Board of Trade) as follows: £5 10s. 6d. p.ct. on the "A" stock, £4 0s. 6d. p.ct. on the "B" stock, and £5 p.ct. on the "C" consolidated stock.

A gradual extension is taking place of the strike movement in France, due to various proposals for reductions of wages. According to the Paris correspondent of the "Daily Telegraph," Strasbourg is without electric light, the trams are not running, there is no gas, and most of the newspapers are not appearing in consequence of the strike of employees at the electric light and gas works.

On Monday evening, the 22nd inst., while entertainments were in full progress, all users of electric light in Leeds were thrown into darkness for twenty minutes, owing to water getting into a condenser at the works. In entertainment houses which have emergency gas lighting, the performances were maintained; but in other halls the programmes were thrown completely out of gear.

The fusing of a wire in connection with electric lighting at the shop of Messrs. Priestley and Ward, decorators, of Halifax, last week caused a fire which, but for exceptionally prompt attention by the fire brigade, promised to develop into a serious matter. Volumes of smoke pouring out of a basement window were noticed by a policeman. As it turned out, the chief damage done was to the lighting installation itself.

The "Welsh National Exhibition, Cardiff, 1922," though thus named, will be international in the widest sense. Intimation has already been received from the Governments of the Dominions and several foreign countries of their desire to participate. The Rt. Hon. David Lloyd George has accepted the presidency of the exhibition, while the Lord Mayor of Cardiff is the Chairman of the Executive Committee. An ideal site of 60 acres has been secured in the centre of the city. The displays by British exhibitors will be housed in the largest individual hall yet erected in an exhibition, the floor-space of which covers an area of 172,800 sq. ft. Provision will be made for gas, electrical, and oil exhibits. Application forms and full particulars can be obtained from the Secretary and Chief Executive Officer, Administration Offices, 4, Mount Stuart Square, Cardiff.

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